Transportation Library

Railway Mechanical Engineer

FOUNDED IN 1832

JAN 22 1934

Vol. 108
1934

TRANSPORTATION LIBRARY

Helping the Railroads to Help Themselves

THE allotment of more than $200,000,000 of PWA funds to the railroads is an effective step to help the railroads help themselves.

Since the money will be used for making necessary improvement and repairs to equipment and other railroad properties, it will aid the railways directly . . . and since it will involve the purchase of equipment and materials, it will stimulate the capital goods industries, increase employment and thus improve general purchasing power throughout the country.

And this improvement, in turn, will benefit the railroads . . . through increased demands for transportation and improved railway earnings.

January, 1934

35¢

REDUCE MAINTENANCE COSTS and INCREASE SAFETY *with* Seamless Pipe

Install NATIONAL Seamless Pipe and you do away with any uncertainty regarding uniform wall strength, an important feature in railway piping. In addition to the increased safety factor, seamless pipe will give all-round better service and last longer under the rigors of modern railway operating conditions.

Each length of Seamless Pipe is made by piercing a solid billet of high quality open hearth steel. Strength is uniform and adequate at every point, in all directions. Ductility to the highest degree is obtained, together with unusual bending and flanging qualities. All NATIONAL Seamless Pipe is made to recognized standard specifications. Service records bear out the judgment of progressive railway engineers who have turned to this product for superior performance. Its advantages appear both in safety of operation and in lower maintenance costs.

Specify NATIONAL Seamless Pipe, especially for new locomotives and cars. NATIONAL engineers will be glad to cooperate on any piping problems. Correspondence is invited.

NATIONAL TUBE COMPANY · Pittsburgh, Pa.
Subsidiary of United States Steel Corporation

NATIONAL SEAMLESS

PIERCED FROM SOLID BILLETS - NO WELDS

VOL. 108 No. 1

Published monthly by Simmons-Boardman Publishing Company, 1309 Noble Street, Philadelphia, Pa. Entered as second class matter, April 3, 1933, at the Post Office at Philadelphia, Pa., under the act of March 3, 1879.

Railway Mechanical Engineer

Founded in 1832 as the American Rail-Road Journal
With which are also incorporated the National Car Builder, American Engineer and Railroad Journal, and Railway Master Mechanic. Name Registered, U. S. Patent Office

January, 1934

Volume 108 *No. 1*

Motive Power Department:

Electric Starting of Diesel Engines..... 13

Car Department:

Service Testing of Journal Lubricants..... 1
A Mechanically Cooled European Refrigerator Car 11
Streamlined Rail Car on Great Western in England 15

General:

The Mechanical Department and Purchases of Materials 3
The Analysis of Equipment Maintenance..... 4
"Shooting" Railroads for the Movies..... 8

Editorials:

Fighting to Get Back Business..... 16
Signs of Distress 16
Honesty—Code or Character?..... 16
Problems of Supervision..... 17
Do We Know Our Unit Costs?..... 17
New Books 18

The Reader's Page:

Answers Reader's Question..... 19
Heating 18-Car Trains..... 19

Car Foremen and Inspectors:

Alec and Dave Are Back Again..... 20
Car Truck Assembling Devices..... 22
Sash-Rack Skid 23
Pertinent Questions on Hot Boxes..... 23
Reconditioning Worn Car Journal Bearings..... 24
Center-Pin Tongs 26
Decisions of Arbitration Cases..... 26

Back Shop and Enginehouse:

Making Cab Curtains..... 27
Floating Bushings in Link Trunnions..... 29
Boring Container for the Wheel Shop..... 29
Driving-Wheel Repairs 30
Combination Die Head..... 31

Clubs and Associations 32

News 33

Index to Advertisers .....(Adv. Sec.) 9

Published on the 26th day of the month preceding the date of issue by the

Simmons-Boardman Publishing Company

1309 Noble St., Philadelphia, Pa. Editorial and Executive Offices,
30 Church Street, New York, N. Y., and 105 West Adams Street, Chicago, Ill.

Cleveland: Terminal Tower
Washington: 17th and H Streets, N. W.
San Francisco: 58 Main St.

SAMUEL O. DUNN, *Chairman of Board*
Chicago
HENRY LEE, *President*
New York
LUCIUS B. SHERMAN, *Vice-Pres.*
Chicago
CECIL R. MILLS, *Vice-Pres.*
New York
ROY V. WRIGHT, *Vice-Pres. and Sec.*
New York
FREDERICK H. THOMPSON, *Vice-Pres.*
Cleveland, Ohio
GEORGE SLATE, *Vice-Pres.*
New York
ELMER T. HOWSON, *Vice-Pres.*
Chicago
F. C. KOCH, *Vice-Pres.*
New York
JOHN T. DEMOTT, *Treas.*
New York

Subscriptions, including 12 regular monthly issues, payable in advance and postage free. United States and possessions: 1 year, $3; 2 years, $5. Canada, including duty: 1 year, $3.50: 2 years, $6. Foreign countries: 1 year, $4; 2 years, $7.

The Railway Mechanical Engineer is a member of the Associated Business Papers (A. B. P.) and the Audit Bureau of Circulations (A. B. C.) and is indexed by the Industrial Arts Index and also by the Engineering Index Service.

NRA MEMBER U.S. WE DO OUR PART

Roy V. Wright
Editor, New York

C. B. Peck
Managing Editor, New York

E. L. Woodward
Western Editor, Chicago

H. C. Wilcox
Associate Editor, New York

Robert E. Thayer
Business Manager, New York

OLD POWER IS A DRAG ON RECOVERY

The large number of obsolete locomotives that now burden the railroads is a handicap to the recovery of earning power. ● Increasing traffic is drawing back into service locomotives that are 15 to 20 years old with a consequent decrease in present efficiency. ● Modern power would speed recovery and increase profits.

LIMA LOCOMOTIVE WORKS INCORPORATED

LIMA LOCOMOTIVE WORKS • Incorporated • LIMA • OHIO

Railway
Mechanical Engineer

Founded in 1832 as the American Rail-Road Journal

January - 1934

Service Testing of Journal Lubricants

By Robert Job*

A discussion of the types of oils suitable for car journal lubrication with particular reference to the conditions of operation in extremely low temperatures

THE quality of car oil, as it is termed—or the oil used for lubrication of journals in railroad service—is a prime essential in securing prompt movement of traffic.

In the south with relatively high temperatures, even in winter, a fairly high body or viscosity in the oil is desired in order to maintain a film strength sufficient to meet all ordinary requirements and avoid possibility of seizure between journal and bearing, with the resulting hot box.

In the north or north-west, on the other hand, the summers may be hot, at least during periods, while in the winters a sudden cold snap may drop the temperature to thirty degrees or more below zero, and cars may remain on a siding or in a yard for hours at a time or overnight, fully exposed to the weather.

Formerly, and sometimes today, two grades of oil were used—for summer an oil of good viscosity, say 55 to 60 sec. S. U. at 210 deg. F., and for winter use an oil with moderate viscosity, say 50 sec. at 210 deg. F. or even considerably less, combined with the ability to remain fluid at low temperatures.

Unfortunately for the peace of mind of mechanical and operating officers, oil which is placed in journal boxes during the summer months is apt in a good many cases to remain in the boxes when cold weather comes with resulting waste-grabs and hot boxes, unless the boxes are repacked with winter oil or unless addition of distillate, cut-back oil or other light-bodied, low-cold-test oil is made to the boxes before advent of cold weather. Such treatment requires special care and attention and is inconvenient, and hence the demand has grown for a year-round oil suitable for summer use and even during extremes of winter. From the nature of the case such demands are exacting, but they have been met with a fair degree of success, though certain properties must be present, or absent, or hot boxes certainly will develop when the temperatures are low.

Successful lubrication with the much desired freedom from trouble necessitates a careful balancing of the many conditions of service, and practical experience under these same conditions undoubtedly is the surest guide in determining just what physical properties in the lubricant are most likely to fulfill the requirements, and it should be kept in mind that an oil suitable for year-round service in some sections of the country, may be entirely unsuited for service under more rigorous climatic conditions.

Table I shows the properties of various car oils which have been thoroughly tried in service under low temperature conditions.

Table I

	1	2	3	4
Service	Unsatisfactory	Unsatisfactory	Generally satisfactory	Under trial
Gravity, 60 deg. F., A. P. I.	19.3 deg.	25.1 deg.	26.7 deg.	22.1 deg.
Flash	325 deg. F.	340 deg. F.	380 deg. F.	335 deg. F.
Viscosity, S. U.:				
@100 deg. F.	475 sec.	300 sec.	295 sec.	305 sec.
@210 deg. F.	56 sec.	54 sec.	49 sec.	50 sec.
–30 deg. F., A. S. T. M. Chart	2,000,000	190,000	625,000	600,000
Precipitation number	Trace	Trace	None	None
Pour point, A. S. T. M.	0 deg. F.	0 deg. F. to + 10 deg. F.	–30 deg. F.	–30 deg. F.
Cold test, Dudley	0 deg. F.	+30 deg. F.	–30 deg. F.	–30 deg. F.
Base	Naphthene	Paraffin	Mixed base	Naphthene
Carbon residue	1.54	2.43	0.82	1.30

In service, Oil No. 1, a naphthene base with relatively high viscosity, proved very unsatisfactory during periods of extreme cold—30 deg. or more below zero F.

Oil No. 2, a paraffin base, with good viscosity for use under normal conditions, also proved unsatisfactory

* Vice-president, Milton Hersey Company, Ltd., Montreal, and chief chemist, Canadian National Railways.

at very low temperatures. In the case of this oil it should be noted that the cold test or pour point is very erratic under the two methods of test, for reasons which will be stated below.

Oil No. 3 gave good average service as a year-round oil.

Oil No. 4 has given good average service during the past spring and summer months. It has not as yet been tested by us in service during the winter, though we anticipate generally favorable results due to its fluidity at relatively low temperatures, even after freezing and thawing and without subsequent preheating, combined with absence of tarry matter.

On referring now to the viscosities of these oils, it will be seen that there is a wide difference between those of No. 1 in comparison with the others, and the projected viscosity of No. 1 at minus 30 deg. F. upon the A. S. T. M. Chart is extremely high. Oils Nos. 2, 3 and 4 have about the same viscosity at 100 deg. F. and not widely different properties at 210 deg. F. When, however, we turn to the pour points, the differences are of striking significance, and in order to point our meaning, a few words of explanation will be necessary.

The Importance of "Pour Point"

When car oil is shipped from a refinery during the winter in a northern climate it may, before reaching destination, be subjected to a very low temperature—say 30 deg. below zero—so that when received it may be frozen solid or nearly so. The oil may be allowed to remain in the shop or stores without special heating until fluid, if not so when received, subsequently being placed in service subject to the ups and downs of winter weather and alternately frozen or thawed.

An important reason for determining the pour point or cold test of a car oil is, as once tersely stated, "to enable one to select an oil that can be applied to a journal from an oil can," and, we might add, at the outdoor temperature prevailing at that time. This leads to a consideration of the methods for determining the "pour point" of an oil.

The standard method of the American Society for Testing Materials specifies that the sample, when received, shall be heated to 115 deg. F. and then shall be cooled gradually and without agitation until movement of the oil on tilting is just perceptible. Under these conditions the pour point or temperature at which Oil No. 2 remained fluid averaged in different shipments about zero degrees F., yet when this same oil was first frozen, as in service, and then *without heating to 115 deg. F.* was gradually cooled, it became solid at about thirty degrees above zero. We thus have the anomalous condition that an oil with an indicated pour point of zero degrees F. actually under the conditions of service may be solid—frozen stiff—at a temperature thirty degrees or so higher. This statement means, of course, that the A. S. T. M. method with its preliminary preheating may give unreliable and misleading indications as to what actually may happen in low temperature service and of the temperature at which the oil may be applied to the journal from an oil can. As a result of this investigation we abandoned the A. S. T. M. pour point in estimating the suitability of oils for use at low temperatures and reverted to the old cold test method devised by Dr. Dudley on the Pennsylvania many years ago. By this well-known method two ounces of the oil are placed in a four-ounce oil bottle, a thermometer inserted, and the oil frozen. Dry Ice is convenient for low-temperature car oils. When the oil is frozen hard the bottle is taken from the freezing mixture and the frozen oil carefully stirred with the thermometer until the oil will flow. This is considered the cold test.

We have used this method for many years in low-temperature work and have always found that the results tallied with those obtained under practical service operating conditions. In other words, the method indicates correctly at what temperature the oil in the oil can or in the journal box will flow or pour after being exposed to low temperatures and without subsequent warming to 115 deg. F. In the cases of the four oils which we have described the indications given by this method corresponded with what actually occurred in service when the oil had been chilled or frozen in transit.

Referring again to Table I it will be seen that in Oil No. 3 (mixed base) and Oil No. 4 (naphthene base) the results by both cold test methods are in agreement, whereas in the case of Oil No. 2 with paraffin base the wide difference to which we have referred appears, due to the separation of paraffin wax. It is hardly necessary to state that any method of test to be of definite practical value must give advance information as to the ability of the material successfully to meet the conditions of service.

Research Has Answered Many Questions

During recent years, investigation work of great importance and interest has been in progress in connection with the technology of lubricants. The relation of viscosities at different temperatures has been carefully studied and as an outgrowth of this work we have the viscosity charts of C. M. Larson of Sinclair Refining Company and of the A. S. T. M. by means of which the behavior of oils which remain fluid at low temperatures may be predicted with a fair degree of certainty. Also the viscosity index, involving a tremendous volume of detail tests and study, permits classification of lubricants along lines which only a few years ago were far less generally understood or appreciated.

In the field of practical low temperature research the work of Chapman on the Santa Fe is worthy of particular note as it gives definite answers to many questions which from their very nature previously had been matters of conjecture, or of painful experience. These researches combined have given a most useful fund of information, though much remains to be learned. In low temperature work we know of the supposedly "slippery" properties of paraffin base oils and of the "sticky" nature of the asphaltic base, but after all, these terms may be merely relative and descriptive of conditions resulting from the presence of small proportions of various constituents or impurities, and capable of correction by means of suitable changes in the methods of refining. What occurs at one temperature may be quite different from that found at a lower range, and as instances in point we may cite Oil No. 1, in our table, the asphaltic type, which in service was unsatisfactory under our northern winter conditions due to "waste grabbing." Also Oil No. 2, the paraffin type, which in theory should have been satisfactory even though solid, but which in practice under low temperatures was not a success, also causing difficulty due to "waste-grabs," and cutting off lubrication just at the time when it was most urgently needed. Oil No. 3, mixed base, might have been expected to become more "sticky" at low temperatures, but in practice it gave far better service under such conditions than Oils No. 1 and No. 2, and similar service is anticipated for Oil No. 4, due considerably, we think, to the fact that in addition to being free from tarry matter, also even at fairly low temperatures (thirty degress below zero) it remained in a fluid condition and thus was capable of feeding the journals, avoiding possibility of waste-grabs. This state of fluidity under the conditions of service

combined with absence of tarry matter we consider in the light of our experience most important factors in the securing of efficient lubrication at low temperature ranges.

In the present paper we have stated the facts as we have found them with the thought that they might serve to help in the general study of the varied requirements of service of this important lubricant and also promote thought and discussion as to the simplest and most effective methods for modifying the properties of the lubricant so that it may meet successfully the conditions which exist in service. Experience in the past has shown that when once the real cause of a difficulty clearly has been known, a suitable remedy generally has not been far distant, and we feel that developments in refining—possibly ones which are very simple—may be found effective in eliminating or modifying the properties of constituents which in low temperature service produce an undesirably strong bond between journal and waste.

The investigation outlined above was undertaken with the active cooperation of the late C. E. Brooks, chief of motive power and rolling equipment, Canadian National Railways, and of his successor, John Roberts.

The Mechanical Department And Purchase of Materials

A purchasing officer suggests ways in which the department can co-operate to better advantage

"WHAT," I asked the Purchasing Officer, "can a mechanical department officer do, from your point of view, which will help improve the efficiency of railway operation as a whole?"

I interviewed this particular purchasing officer because I felt that on the basis of his earlier training and experiences he would approach the subject with a sympathetic understanding and on a more or less fact or scientific basis. He had not the slightest intimation in advance of why I wished to see him and his reactions where therefore more or less automatic—he had no time for making a studied reply.

Unripe Plans

"First," said he, "as I think of it now, one of our difficulties in handling material for the mechanical department has been due to 'unripe plans.' A project is started, considerable amounts of material are ordered and placed in stock, and then without a moment's notice, the plans are changed. In some instances, of course, the material can be adapted for other purposes without too great a loss, but sometimes it is of such special design or nature that we cannot make use of it. Eventually, of course, it is sold as scrap or destroyed; meantime it takes up valuable space and is a constant source of expense. More study and consideration in the first place would have avoided or have considerably reduced this hazard."

"What point would you make next?" I queried.

Reasonable Assurance of Success

"You understand," replied the Purchasing Officer, "that I am not making these suggestions in the order of their importance, but simply as they come to mind. The second thought that occurs to me—and it is closely allied to the point that I have already made—is that in a few instances, at least, the mechanical department on our road has made rather large installations of devices or equipment without having reasonable assurance of a successful outcome.

"I do not mean to infer that the railroads should not experiment with different designs and different types of equipment; as a matter of fact, that is the only way in which progress can be made. We must expect a certain percentage of failures as we experiment with new ideas. I have noticed, however, that in the enthusiasm of the moment, department officers will sometimes place rather large orders for a new or experimental device which has not yet been tried out thoroughly on our own road, or any other railroad, for that matter. We stock up with spare parts for repairs, or extra sets for application as the equipment is rebuilt. The bubble bursts and we find ourselves with surplus unusable stock on hand. An examination of our storehouses or storeyards will unearth several white elephants of this sort." The Purchasing Agent mentioned some of these "white elephants" by name. I hesitate to identify them because of sad memories that they may stir up in some quarters.

Before I could ask another question the Purchasing Officer started to make another observation.

Research within the Department

"It seems to me that the mechanical department should do a greater amount of research, within its own organization, as to the suitability and performance of different materials and different products. The railway supply people have made a remarkable job in improving their devices and materials, but frequently when a number of different companies make bids on a tool or a material, we have great difficulty in determining the relative value of the different makes. I am thinking now of common products used in everyday service; it would seem that the mechanical department would, to protect its own interests, make careful tests and comparisons, in order to be sure that it is furnished with the best product for the particular purpose for which it is required.

"I can see by the expression on your face that you are surprised at this statement. And yet, if you were to spend much time in an average railway purchasing department office, you could easily recognize how valuable it would be to us if such information were readily available. You understand, of course, that we do have a testing department on our road, and that it does test many materials, but on the other hand, there are a great many products which should be given similar treatment and concerning which we have great difficulty in determining which is best suited to the needs of the mechanical department.

"There is still another phase of this problem. There can be no question at all about the importance and value

of many patented articles. Sometimes, however, we find that we pay a very high price per pound for these articles, when a bit of research and investigation might indicate that we could get an equally good product at a lower price. I am not trying to discourage the use of high grade special devices, but rather to insist that more careful research work be done to assure that they are really worth as much as we pay for them, and that some other cheaper product cannot do the job as well, or better."

Programming Work

"How about the purchase of materials for extensive equipment rebuilding programs?" I asked. "Presumably this is a simple proposition, which does not give you much trouble."

"On the contrary," replied the Purchasing Officer, "quite the opposite is true. Too frequently the mechanical department does not give adequate attention to programming the work. For instance, it is quite likely to come at me with a requisition for the material for a large project, asking that all of it be delivered prior to a certain date. A little questioning may develop that the work on the project will extend over many months, or even as much as a year. You can readily understand that the purchasing department may be able to make advantageous contracts for such material on the basis of the time it will actually be needed on the job, allowing, of course, an ample factor of safety to cover emergencies. Handled in this way it also reduces our storekeeping costs and in some instances may prevent finding ourselves with a lot of material on our hands which we cannot use and which in time becomes obsolete.

"Even the best of programs—and this has been particularly true during the last few years—are liable to be canceled or greatly modified if the work extends over a considerable period of time. If the material is delivered, it must be paid for, and if it is not used promptly it piles up our inventories. This programming of work is one of the greatest difficulties that we have to work out with the mechanical department and yet it is of prime importance that such programs be carefully laid out in such a way that the purchasing department can take full advantage of the schedules which may be adopted."

"Presumably," I ventured, "you are kept closely informed as to tendencies in equipment design and can guard against stocking up materials that may become obsolete."

"That is an embarrassing shot," countered the Purchasing Agent. "The mechanical department may study for a long time the possibility of making certain changes in design or of adopting some new specialty. Knowing nothing of what it is doing, we suddenly wake up and find ourselves with a large amount of material on hand, when an order goes out that following such and such a date a new design or device will be applied in place of that which has heretofore been standard equipment. Sometimes, too frequently quite by accident, we learn that the mechanical department is experimenting along certain lines, and then if we are wise we immediately check up on our material and see that new orders are not placed until we are reasonably sure that no changes will be made in the near future.

"Having said all these things by way of suggestion, please do not think that I am critical," continued the Purchasing Agent. "Our relations with the mechanical department are cordial and I am sure that we both do our level best to co-operate with each other. I do believe, however, that much can be done to improve conditions along the lines I have indicated."

The Analysis of Equipment Maintenance*

By Lawrence Richardson †

Accurate records of repair costs and the analysis of these records will serve as a guide to improvements in maintenance conditions

IN analyzing equipment-maintenance expenses for the last 10 years and the corresponding gross income for the same period, the ratios existing between them show the benefits derived by the intensive drive to improve general mechanical efficiency. The relations are shown graphically in Fig. 1. Maintenance-of-equipment expenses have decreased steadily. The ratio of gross income in 1922 was 22.5 while in 1928 it had been reduced to 19.1, a reduction of 15 per cent.

The trend in gross income, comparing 1922 and 1928 has been an increase of 10 per cent. Stated in another way, out of a dollar received in 1922 as gross income, 22.5 cents was spent for equipment repairs, while in 1928 out of the gross income dollar only 19 cents was spent for equipment maintenance. This decreased ratio meant a saving of over $200,000,000 for 1928 as compared with 1922. The ratio has increased slightly during the depression as the use of equipment and the number of units have not dropped as much as has the income.

The gain from the reduced equipment-maintenance expenditures has been entirely net, no additional expense being added to the other departments. In fact, conditions have been markedly improved as reflected by fewer locomotive and car failures. One of the most interesting facts brought out by an analysis of the maintenance-of-equipment expenditures for the 47 largest railroads in the United States is that lowest costs are attended by a better condition of equipment. The fallacy that a good power and car condition costs money is refuted by Figs. 2 and 3.

* The abstract of a paper presented before a meeting of the Railway Club of Pittsburgh held at the Fort Pitt Hotel, Pittsburgh, Pa., September 28, 1933.

† Mechanical assistant to the vice-president and general manager, Boston & Maine.

In the locomotive chart these railroads have been divided into four groups, arranged as to cost of repairs per locomotive mile 0 to 20 cents, 20 to 25 cents, 25 to 30 cents and 30 cents up. The condition of power in each group was taken from federal reports. The average condition in the lowest cost group is the best, while that in the highest cost group is the worst. The leaders in each group show an even more striking relationship. The best condition in the highest cost group is 90 times the best in the lowest cost group.

Fig. 3 showing freight-train-car conditions reflects a similar condition. The costs and condition of cars have been taken from federal reports furnished by the Bureau of Statistics of the I. C. C. The lowest cost group is also the best condition group.

These charts of cost and condition explain the truth of E. H. Harriman's policy that "A dollar saved by deferred maintenance brings about a subsequent expenditure of two dollars."

It is important that savings effected in mechanical maintenance be real economies and not result in a poorer condition that ultimately causes an actual loss.

In checking costs it is important that the effect of age be not overlooked. Fig. 4 shows the relationship existing between age and repair costs. This chart was developed by T. R. Cook.[1] It will be seen that costs

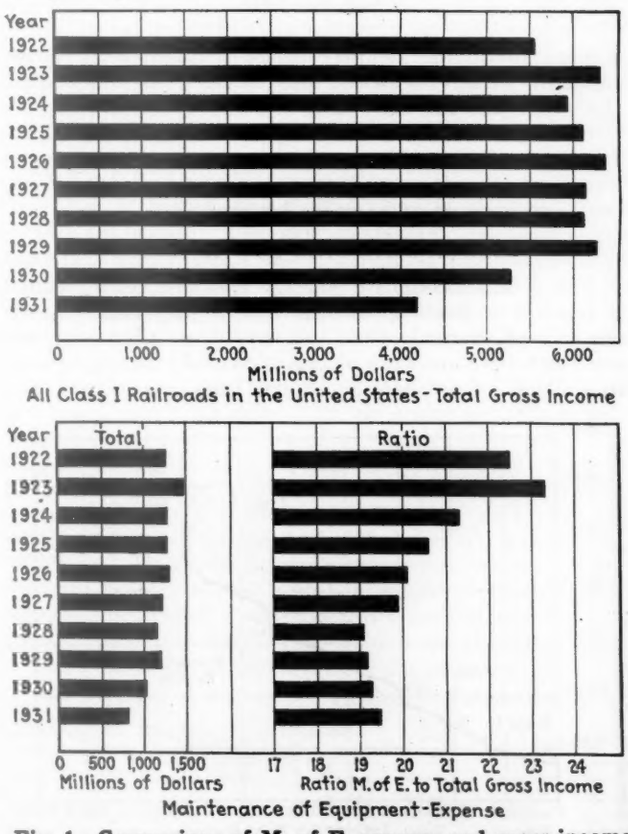


Fig. 1—Comparison of M. of E. expense and gross income for 10-year Period

increase approximately 4 per cent per year. One railroad may have locomotives costing 10 per cent more than another, but if the age of the power exceeds the other by more than 2½ years, its record is actually better.

The transportation department has realized more than a full share of benefit from these conditions. Where a good hot-box record in 1922 was expressed in tens of thousands of miles, in 1932 it was expressed in hundreds of thousands of miles. Locomotive failures have decreased likewise. This has brought train delays due to mechanical failure to a minimum, resulting in faster movements and an almost complete elimination of overtime in through service. Fast freight-train service has approached the reliability of passenger service.

Factors Resulting in Improvement

The three primary factors supporting this improvement in equipment maintenance are (1) higher degree of skill in labor; (2) improved design of equipment, and (3) closer analysis of cost.

The advance in skill is the result of education and stabilization. Supervision plays as large a part in the

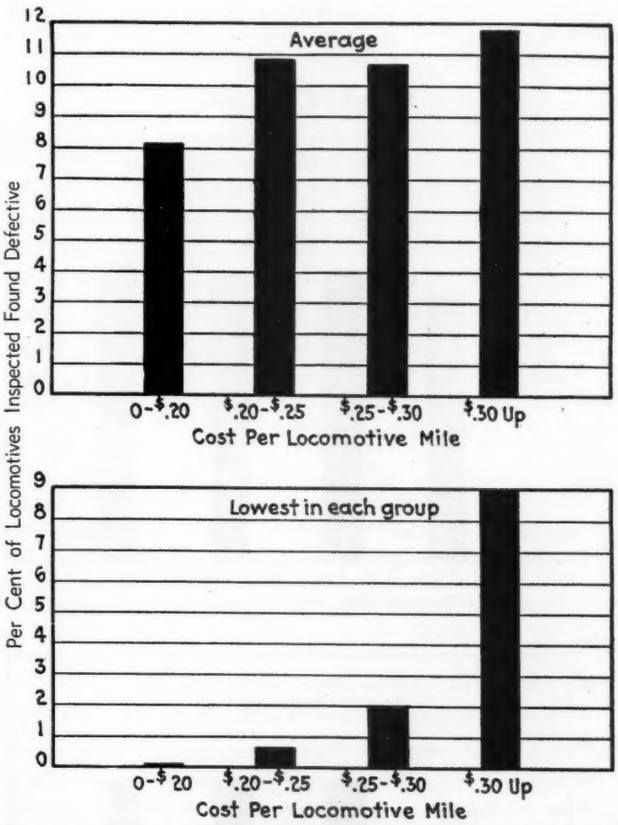


Fig. 2—Cost of repairs per locomotive mile compared with percentage of locomotives inspected and found defective—Data from 47 largest railroads in United States for year 1931

former as does the man. The mechanic arts are constantly advancing. To keep supervisory forces abreast of the times it is necessary to stimulate interest in railroad clubs and associations. Foreman training more than justifies itself in the results attained. An increased number of helpers have been advanced to journeymen. They must be fully schooled in their duties in order to perform properly the work assigned them. Stabilization has eased this problem somewhat as the reduced turnover meant fewer new men hired. Estimates of the cost of hiring a new man and breaking him in average $125, a direct charge which must be absorbed in cost.

Design has played its part in this improvement. A. R. A. committees are constantly at work studying standards and establishing specifications. This work brings about a reduction in the costs of maintenance. The supply concerns have more than contributed their share in the production of better materials and the development of specialties.

[1] Baldwin Locomotive Works.

Research and test work have reduced failures and lengthened service. The draft-gear and air-brake tests conducted by the American Railway Association are two outstanding examples of co-ordinated research with an adequate program and personnel. The benefits to the member roads from these tests and developments have fully justified the efforts.

While general analyses are helpful, it requires an analysis in detail to accomplish the best results. It is not sufficient to know that maintenance in general is high. One must know what parts or members are not giving economical service. But a detailed individual cost accounting of freight cars entails a prohibitive cost, just the same as a test of every bar of steel. To get this desirable information at a reasonable cost, a system was devised to analyze a small number carefully and use this information as a control of the whole series.

Freight Car Costs

Twenty-five cars out of each series were stencilled "M.T.C." To the repairman they are, to all intents and purposes, foreign cars. He makes an A. R. A. bill for

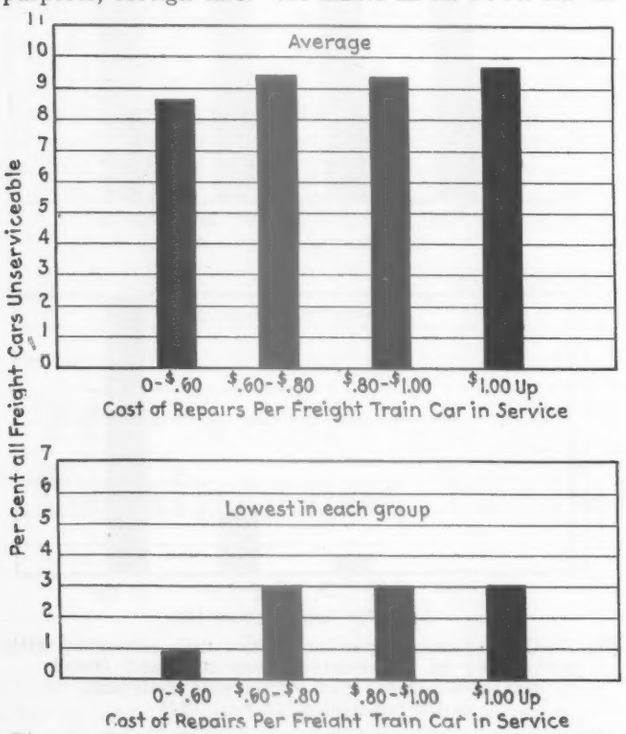


Fig. 3—Cost of repairs per freight-train car in service compared with percentage of all freight cars unserviceable—Data from 47 largest railroads in United States for year 1931

every job. These bills are sorted out as they pass through the A. R. A. Billing Bureau and turned over for compilation and accounting.

Table I shows the costs of running repairs only for a twelve months' period. The general design of the cars is indicated at the top of each column. The figures are self-explanatory. The detail is sufficient to answer questions raised as to performances of individual parts.

Of particular interest are the columns for A. R. A. single-sheathed box cars and all-steel hoppers. The excellence of the design of these cars is quite readily noted. Trips to the repair tracks are few and far between. When a shipper loads one of these cars he has an assurance that his load will go through to destination without being delayed on repair tracks. The principal items of cost are those involving periodical work, principally air-brake cleaning and journal repacking. The new AB brake is solving one problem. Cast steel has already eliminated other causes. The cost of truck parts for these cars to date is nothing. Compare this record with arch-bar and other types of built-up trucks. Such performance assures the safest possible operation.

A study of these costs over a period of years has developed the necessity and economy of doing a complete job when cars are in the shop for general repairs.

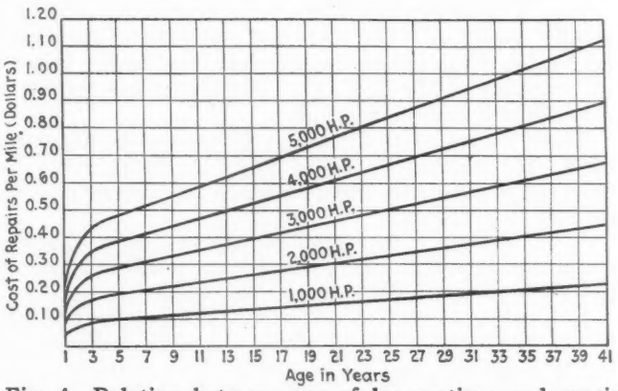


Fig. 4—Relation between age of locomotives and repair cost per mile

Failure to do the required work at such times is not economy in any sense of the word. The bills show that such jobs are only deferred at multiplied costs.

Designers will find these figures are splendid guides for their efforts. They point out the particular items that need attention and betterment. In answering them costs are lowered and service bettered.

Locomotive-Mile Cost Records

Fig. 5 is a locomotive mileage and cost record which is possible to keep up to date with a surprisingly small amount of clerical work. Locomotive miles run are used as a base and cost of classified and running repairs in dollars as ordinates. Radial lines are drawn for

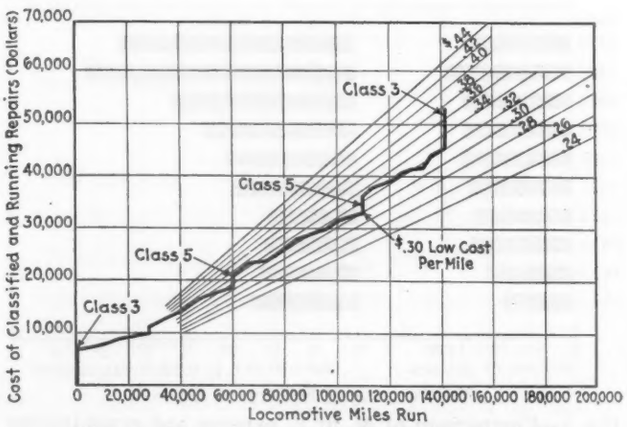


Fig. 5—Locomotive mileage and cost chart

each rate of locomotive repair cost per mile. There is a 26-cent line, a 28-cent line, a 30-cent line, and so on. The lines are readily drawn by the determination of a single point. With that and zero as the other point a straight line is drawn. An average cost of 30 cents per mile at 50,000 miles would be $15,000. At 100,000 miles it would be $30,000. A check of each straight line will show the same relation to hold at any other point.

The cost record of an individual locomotive is shown on the chart. It starts with the cost of a Class 3 repair

Table I—Freight-Car M.T.C. Maintenance Study—One Year Period March 1, 1932, to March 1, 1933, Running Repairs Only—Mechanical Department, Boston & Maine

		60,000-lb. cap. box	80,000-lb. cap. box	U. S. R. A. double-sheathed box	A. R. A. single-sheathed box	Flat	100,000-lb. cap. comp. gondola	140,000-lb. cap. all-steel hopper	Refrig.
1	Wheel changes	$72.60	$37.97	$175.34	$13.40	$215.53	$126.40	$25.55	$182.34
2	Journal boxes	8.99	1.32	12.39	2.27	2.29	15.82	....	17.65
3	Journal bearings	13.02	17.78	12.67	7.84	17.38	26.31	6.44	22.14
4	Brake beams	5.15	.35	22.85	19.40	....	3.55	....	27.18
5	Brake shoes	8.72	12.73	17.59	3.77	5.51	11.40	.56	86.52
6	Truck parts	35.23	182.30	2.41	23.13	6.70	32.49	....	228.94
7	Brake rigging	4.86	10.60	1.90	15.48	7.75	7.30	.40	12.68
8	Train line	7.86	16.92	14.62	1.02	20.34	32.88	1.33	104.49
9	Air hose	9.90	24.75	21.45	28.05	27.42	13.20	23.10	146.85
10	Angle cocks	4.05	2.70	2.70	....	7.05	6.27	1.35	17.55
11	Air-brake cleaning	86.82	86.10	91.31	90.47	77.24	91.07	110.95	27.75
12	Hand brake	....	2.70	3.48	....	21.22	8.65	....	.90
13	S.ll, steps, etc.	16.47	14.87	22.61	1.50	15.04	12.40	1.71	15.89
14	Draft gear	106.85	4.80	1.10	81.09	29.15	.20	2.10	23.21
15	Couplers	46.21	91.32	43.83	5.82	.87	6.37	....	19.29
16	Yokes	11.80	16.60	68.10	....	....	....	....	....
17	Body	27.88	26.31	48.20	54.91	.90	15.17	....	72.36
18	Doors	26.78	70.36	115.01	2.65	....	....	....	46.54
19	Hopper	....	....	....	....	....	18.13	2.87	....
20	Floor	....	....	8.13	2.35	119.26	275.58	....	1.54
21	Lining	13.35	33.90	31.74	9.79	....	....	....	.54
22	Underframe	.55	....	.20	.20	....	....	....	.95
23	Center plates	12.46	16.00	5.50	3.73	2.90	....	....	....
24	Miscellaneous	37.80	41.70	75.75	34.25	74.65	57.30	80.60	302.40
25	Total charges	$557.35	$712.08	$798.88	$401.12	$651.20	$760.49	$256.96	$1,357.71
26	No. cars involved	25	24	26	25	25	25	25	25
27	No. car-days—home	8,522	8,121	8,158	7,414	7,964	8,068	8,161	7,263
28	No. car-days—foreign	603	639	1,332	1,711	1,161	1,057	964	37
29	No. car-days—total	9,125	8,760	9,490	9,125	9,125	9,125	9,125	7,310
30	Per cent home days	94	93	86	81	87	88	89	99
31	Per cent foreign days	6	7	14	19	13	12	11	1
32	Maintenance per car-day—home	$.059	$.072	$.085	$.041	$.055	$.084	$.029	$.191
33	Maintenance per car-day—foreign	.088	.198	.081	.055	.175	.081	.020	....
34	Maintenance per car-day—total	$.061	$.081	$.084	$.044	$.071	$.083	$.028	$.191
35	Average age of cars, yrs.	24	21	14	3	10	14	4	26

Note: All of the above cars have steel underframes.

at zero mileage, running costs and mileage being added monthly. It is essentially a curve of total costs vs. total mileage. It is continued until the next general shopping. The curve shown covers an actual case and shows the loss occasioned by running too great a mileage before shopping for general repairs. There were two Class 5 repairs, one at 60,000 miles and the other at 110,000 miles. The cost at 60,000 miles was 31 cents per mile. The Class 5 repair at this point fully justified itself, because the cost dropped to 30 cents at 110,000 miles. However, the Class 5 repair at this point did not justify itself, because the cost only dropped back to 32 cents at 142,000 miles, when it was necessary to shop the locomotive for a Class 3 repair. The actual loss was 2 cents per mile over the entire 142,000 miles, or $2,840.

With charts of each locomotive periodically checked for excess cost per mile, they are particularly useful in determining the economical mileage of each class as well as the proper shopping of each individual locomotive.

Table II shows the information on the reverse side of the card shown in Fig. 5 with a record of the monthly mileage and monthly running and classified repair costs added, the totals only being posted on the chart. A record is also maintained of the classified repairs by points and the total cost of each repair.

The future of mechanical maintenance is challenging. Competition is becoming more pressing, demanding lowered costs. As in the past, the mechanical department is called upon to carry its full share of the load.

Average labor rates in mechanical maintenance are high, being exceeded only by three other groups, according to Department of Labor reports. This means that maximum production and efficiency must be attained to hold our own with lower paid competitive groups. This calls for the best of engineering and planning. It can be done. Mechanical men have successfully met their problems in the past and will continue to meet and solve them as they arise.

A fuller appreciation of mechanical problems by the higher executives will be helpful. Proper backing and an adequate share of capital expenditures will enable mechanical men to do their part. The standard of living in any nation is based on the industrial development of that nation. A high state of mechanical development means a high standard of living. The same is true of individual railroads.

Table II—Locomotive Mileage and Cost Data Card

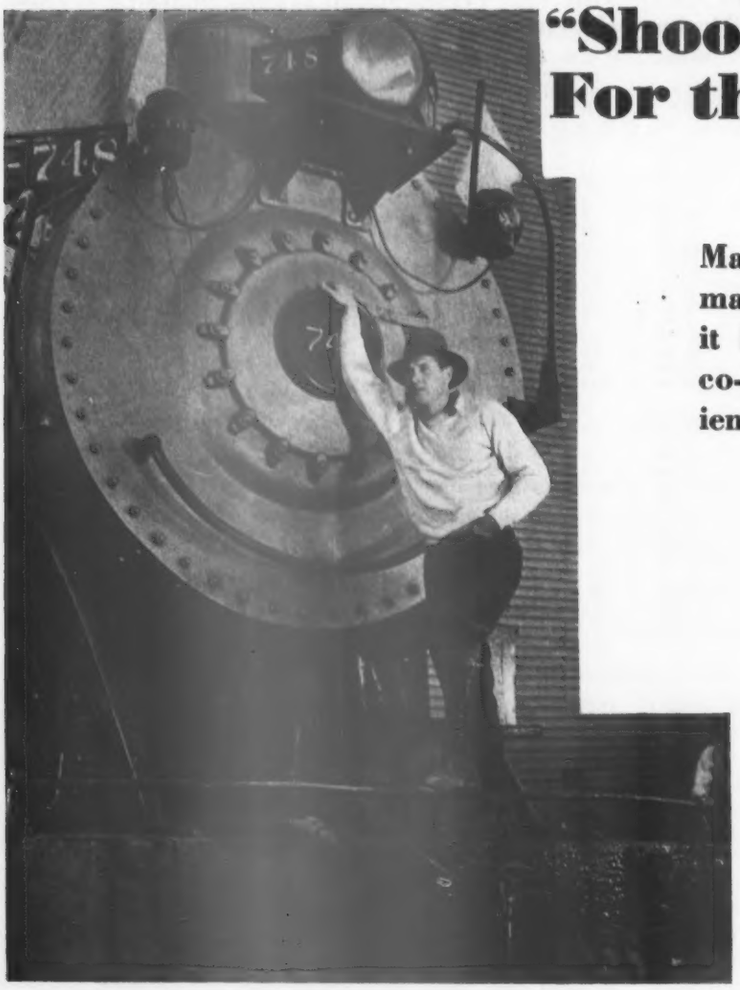
Locomotive No. 7304. Division..... Class.....

	1929		1930		1931		1932		Record of Heavy Repairs			
Month	Repairs	Miles	Repairs	Miles	Repairs	Miles	Repairs	Miles	Class	Shop	Cost	Miles
Jan.	....	....	$ 662	3,764	$ 648	4,864	$ 640	2,584	3–6–'29	Bill.	$7,190	....
	....	....	10,226	26,308	26,860	82,976	40,380	125,024	Un–2–'30	E. Deerfield	1,376	....
Feb.	....	....	1,976	4,652	964	4,656	802	2,696	5–8–'30	Bill.	2,844	60,000
	....	....	12,202	30,960	27,824	87,632	41,182	127,720	5–7–'31	Bill.	2,646	110,000
March	....	....	1,501	4,794	1,076	4,884	598	2,884	3–9–'32	Bill.	8,458	142,000
	....	....	13,703	35,754	28,900	92,516	41,780	130,604	....	....	....	....
April	....	....	996	5,780	1,378	5,136	562	2,646	....	....	....	....
	....	....	14,699	41,534	30,278	97,652	42,342	133,250	....	....	....	....
May	....	....	966	6,024	1,530	5,064	624	2,040	....	....	....	....
	....	....	15,665	47,558	31,808	102,716	42,966	135,290	....	....	....	....
June	....	....	919	4,860	1,156	4,936	688	1,964	....	....	....	....
	....	....	16,584	52,418	32,964	107,652	43,654	137,254	....	....	....	....
July	$7,460	3,934	1,204	5,780	3,246	2,100	582	2,460	....	....	....	....
	7,460	3,934	17,788	58,198	36,210	109,752	44,236	139,714	....	....	....	....
Aug.	416	3,564	3,256	1,802	664	2,894	574	2,282	....	....	....	....
	7,876	7,498	21,044	60,000	36,874	112,646	44,810	141,996	....	....	....	....
Sept.	340	3,736	840	4,540	816	2,640	....	....	....	....	....	....
	8,216	11,234	21,884	64,540	37,690	115,286	....	....	....	....	....	....
Oct.	384	3,446	1,370	4,002	594	2,256	....	....	....	....	....	....
	8,600	14,680	23,254	68,542	38,284	117,542	....	....	....	....	....	....
Nov.	446	3,364	1,354	4,684	618	2,058	....	....	....	....	....	....
	9,046	18,044	24,608	73,226	38,902	119,600	....	....	....	....	....	....
Dec.	518	4,500	1,604	4,886	838	2,840	....	....	....	....	....	....
	9,564	22,544	26,212	78,112	39,740	122,440	....	....	....	....	....	....

"Shooting" Railroads For the Movies

Many train pictures are being made in various studios—How it is done—How the railroads co-operate in bringing the Orient to the camera

By A. B. Laing



Richard Arlen as the strike leader in "Golden Harvest" poses on a locomotive in Oregon

THE first movie actress was a locomotive. You remember—if your theatrical experience embraces Biograph days of 1911—how she roared down the tracks, straight for the folk who sat in the front rows of the opera house. And how those of the audience who believed in Safety First jumped from their seats and scuttled for the aisles and exits; resuming their places only after the danger had passed.

Today this pioneer actress has lost her terror for theatregoers, but none of her early allure. Symbolizing power and speed, drama, passage of time, she is the director's favorite. Performing with ever-increasing realism (thanks to improved cinemacraft and co-operation of railway officials), she has, as Paul Snell, of the Fox organization, puts it, "box-office drawing power."

The thundering express (photographed sometimes from pits excavated under the tracks) spells romance, going places, doing things—excitement for the audience. Trains, moreover, are playing an increasingly important role in screen stories. Whereas the novelist or story teller may *write*, e. g., that his character has left for Chicago via Grand Central, and satisfy his reader, the movie director must *show* her actually leaving; reproduce the sound of whistles and escaping steam and air, and perhaps later show the flyer skimming across the countryside.

Following the financial success of the English-made picture "Rome Express," the Hollywood studios have bought numerous scenarios in which the entire plot or action of the piece is laid aboard some famous flyer. Snell advises that his company is completing one called the "Oriental Express," and directly that big picture is shipped out of the studio in its little tin box, "Sleepers East" will be moving along (in production).

The "Oriental Express" features no star—rather it portrays the love life of a railway conductor with a sweetheart planted in every port of call from Ostend to Jugoslavia. You see the train entering and leaving various continental depots; it is "shot" with such fidelity to detail that you find it difficult to believe it was manufactured *in toto* inside a Hollywood "sound stage."

The Fox company has erected one of these buildings (approximately 500 ft. x 150 ft. x 90 ft.) and equipped it as a permanent "train set." There is a track—standard-gage rails and properly ballasted ties—extending the length of the building and beyond (outdoors). A full size "property" locomotive stands by with a string of four cars which are equipped with regulation air brakes. Exterior working parts of the locomotive are actuated by mechanical means, and the whole train is moved back and forth by an electric winch and wire cables at either end—an ingenious provision for facilitating the endless rehearsals and retakes incidental to first-class motion picture production.

So as not to hamper microphone recording, all escaping steam seen rising around car and cab windows is led in through a 6-in. hose under low pressure and directed to the spot in focus by means of electric fans.

Train orders, dispatches and stationery of all kinds are usually run off in the studio print shop, using fictitious railroad names, so as not to give any one road undue publicity or run foul of the copyright laws.

To adapt it to the "Oriental Express," this entire American train was rebuilt to represent its continental sister. Complete blue prints of the Belgian train were courteously loaned by Les Ateliers Metallurgiques for

the purpose. From these drawings, all coaches were constructed in the Fox shops. Every distinguishing mark of the Belgian train, from heavy forgings to miscellaneous coach hardware, was carefully duplicated. Where possible, junk equipment or spare parts were purchased from local railway shops; otherwise, it was turned out in the studio mechanical departments. All told, about 1,800 studio technicians—from electroplaters to leather workers—obtained employment on the train.

Since most of the action took place within the coaches, the roofs and ceilings were built demountable. To make one shot in the observation car, 60 spot lights, each weighing from 100 to 680 lb., had to be chain-hoisted to the car roof so as to adequately light the set and enable the microphone boom to follow the characters as they moved about in the car.

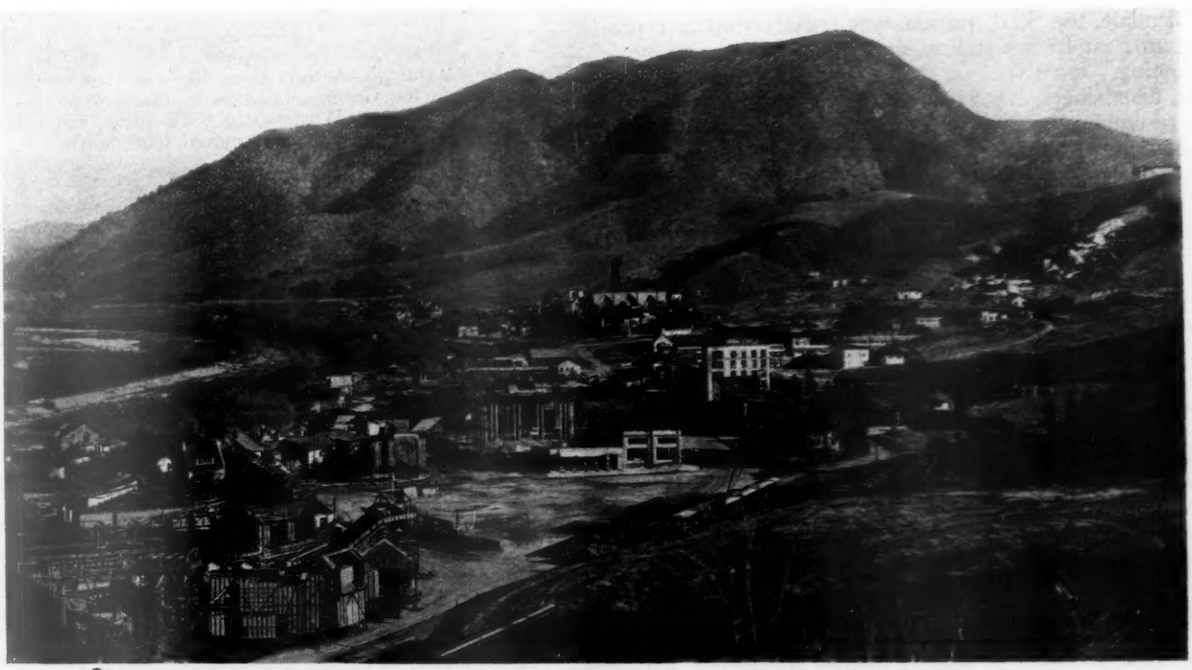
Railway trainmen and engineers are inclined to carp sometimes at obvious discrepancies from standard train practice as shown on the screen. One realizes that these devices are not subterfuges to "cheat" the audience. They are made necessary because of the peculiar limitations and requirements of cinematography and sound recording; they are carefully planned with the idea of advancing the action of the piece and enhancing audience enjoyment; they save time —in an industry which reckons its "overhead" at $2,500 per hour.

Occasionally, to be sure, scenes are of such a nature they must be shot "on location," as was the case with the current "Bombay Mail." Railway arrangements in this case were typical:

In consultation with the director of the picture Martin F. Murphy, production manager of Carl Laemmle's Universal Studio, decided that a number of real stations and trains were necessary. Negotiations were opened with the Los Angeles offices of the Southern Pacific Company. Officials of this company and Jack Lawton, studio location manager, inspected the proposed sites, agreed on the amount of trackage and trains required and the amount of camouflaging each station would have to undergo to resemble the regular way points between Bombay and Calcutta. (Every last detail must be authentic or East Indian "fans" would squawk.)

The S. P. leased a string of flats and furnished the studio art department with complete plans, specifications and photographs of these flats. The studio research department, which has on file complete "train data" ranging from travel articles, advertisements of equipment, etc., clipped from railway magazines, down to museum volumes, furnished the art department with this literature. From this data the art-department ran

Scene in the "Bombay Mail," a Universal picture, shot at Chatsworth, Cal., on the Southern Pacific



Universal City with the railroad station, platform and cars in the center

off colored perspectives of the trains and stations for the director's o. k.

When approved, complete working drawings were put in hand. Coaches, etc., were rigged on the flats. When the work was completed by the studio mechanical departments a Southern Pacific locomotive was found which only needed a pair of front bumpers and removal of the pilot, plus some blinds on the driver's cab. Unemployed railroadmen who looked like Hindus were obtained by the casting director. The "prop" department furnished the train butchers with their betel nuts and other exotic East Indian confectionery.

Glendale, the S. P. station, was transformed to represent an East Indian station, and engaged for one night's "shooting," from 6 p. m. to 7 a. m. All S. P. baggagemen, dispatchers, call boys, etc., on regular duty who did not resemble wealthy English tourists, or who were not garbed as Hindus or Mohammedans, were instructed how to keep out of focus during the night.

Said Lawton, the studio location manager: "The S. P. furnished us with their schedule of bona fide trains arriving and departing throughout the night. In this case—as always—the railroad officials were most helpful. In policing the set, in first-aid provisions, and in every way, in fact, the railway lines co-operate with us absolutely 100 per cent."

Leroy Johnston, the publicity director of Universal Studios, estimates that over 10,000 people, attracted by the powerful lights, visited the S. P. station in the one night to watch the "vice-regal party" entraining and detraining from their snow-white coach, with their Punjab lancer escort in crimson tunics and the motley East Indian crowd.

Besides "Bombay Mail," forthcoming pictures will reveal every phase of railway operation to the public. Word comes that Metro-Goldwyn-Mayer is producing "Roundhouse Mag," with Marie Dressler in the title role; to be followed by similar themes from every major studio in Hollywood.

This cycle of railway entertainment has a certain significance to railwaymen. To some few skilled, experienced railway engineers or practical railroaders, it affords an opportunity to consort with the stars for a few weeks (at a comfortable salary and with "screen credit" to boot) as "technical director." But, more important, it is clear that the series will perform a helpful service to the railway industry as a whole: (1) in providing a helpful "tie-in" to the regular advertising and promotional efforts of the railroads, and (2) in helping to make the movies' 55,000,000 weekly audience "travel conscious."

A scene on the "Oriental Express" made in the Fox studio

River No Obstacle.—A little thing like the Danube river was no obstacle to the German railways in the erection of a new station at Tuttlingen, Wurtemberg. To make room for the station, the bed of the river was moved some miles.

Selling Katy Box Cars.—Unusual enthusiasm has attended the sale of worn-out box cars to farmers and others by the Missouri-Kansas-Texas. In dismantling 1,400 out-of-date cars last year, 75 furloughed employees were called back to work on the program. "Twenty truckers have applied for the job of moving the cars to the farms," remarked the Parsons Daily Sun, in an editorial commenting on the reclamation program, "and each truck requires two men. That is employment for 40 additional men. Many of the cars are remodeled when they get to the farms. They are set up on concrete foundations to furnish a hog shed below and feed storage above * * * * and everything else that a farmer needs in the way of barn or storage room * * * * every time a farmer remodels or remakes or paints, he buys some material with which to do the work. That means business." For a number of years it has been the Katy's practice, when freight cars reach a condition for retirement, to assemble them at the reclamation plant at Parsons, Kan., where, after the wheels and certain steel parts have been removed, the car bodies are offered for sale to farmers at prices varying according to the condition of the cars, for use as granaries or additions to barns, and, in rare cases, even as a place of residence. Last year the sale of cars was not confined to farmers, for 33 were acquired by the Citizen Conservation Corps for use as shelters in the Kansas encampment.

A Mechanically Cooled European Refrigerator Car

A NEW type of mechanically cooled refrigerator car, developed and operated in Europe by the Altek Company, Antwerp, Belgium, is being considered for use in this country, a feature of the cars being the unusually extensive and effective use of Dry-Zero blanket insulation.

Altek refrigerator cars are unique in that they are the only perishable goods cars ever awarded certificates of capability by Lloyd's Register of Shipping. During the five-year period that Altek's mechanically cooled cars have been in service abroad, they have made an impressive record, with a loss of perishables of only 1.6 per cent. The refrigerating cost per car under maximum conditions is approximately 48 cents a day, according to Altek, and servicing costs also are said to be low. This performance is especially notable when the adverse conditions accompanying long hauls in Europe are considered, such as delays at national frontiers, the handling of the cars by train crews of diverse nationalities, and poor track conditions.

In addition to this performance record, there are several exceptional features that make the Altek design interesting to American refrigerator car builders and operators. One is the use of an 8- to 10-hp. full Diesel motor to operate the refrigerating unit comprising a two-stage ammonia compressor which is built to maintain, for 8 days without servicing, any desired temperature between 15 deg. and 60 deg. F., under external conditions, varying between 0 deg. and 110 deg. F. Another is the use of unusual provisions for insulation—7 in. in the roof, 6 in. in the walls and 5 in. in the floor. These thicknesses are composed principally of an extremely low conductivity material, specified to minimize refrigeration cost and to provide a large factor of safety for perishable loads in the event of delays or breakdown of the cooling equipment. If such occurs, Lloyd's insist that the car not be opened or unloaded but be carried to destination because they prefer to rely on the excellence of the insulation to protect the insured lading.

Both cork and Dry-Zero are used in unusual thicknesses to get the desired insulating effects in this car. Refrigeration is obtained from a Diesel-driven ammonia compressor

Both the refrigerating system and the design of the car proper are the result of Altek's own research. The decision to use an internal-combustion engine to operate a plant intended to run without attention in a railway car was considered a daring step by many engineers, although the most modern Diesels have reached a degree of reliability. In addition, certain safety devices have been developed which tend to protect the plant against any normal breakdowns. In fact, the simple and sturdy design of the plant, and the use of these safety devices, are largely responsible for Altek's obtaining Lloyd's certificates on the cars.

The Altek refrigerating plant is housed in a space 3 ft. 6 in. deep, extending across one end of the car. The two-stage ammonia compressor, of interesting and advanced design, is connected to the Diesel motor by a geared transmission. The remainder of the equipment consists of an evaporator in the form of a direct air cooler, an air-cooled condenser, a 3-kw. generator driven by V-belts from the Diesel fly-wheel, an electrically driven fan which circulates air in the car and an electric heating apparatus for use when particular cargoes require it. Fuel and water tanks are installed under the

An Altek refrigerator car—The mechanical refrigerating equipment is located in the compartment at the rear end of the car

engine-room roof. A special control gear governs the automatic operation of the refrigerating unit. Although the plant is designed to operate without attention except at terminals, regular railway trainmen may be instructed to do emergency supervising, if necessary.

In the construction of the Altek car, which is generally

Interior view of an Altek refrigerator car. Chilled air is blown by an electric fan along an air duct under the roof. Ports in this duct distribute the air over the length of the car. The chilled air drops evenly over the cargo and is returned through the grid at the bottom of the bulkhead to pass again over the refrigerating coils

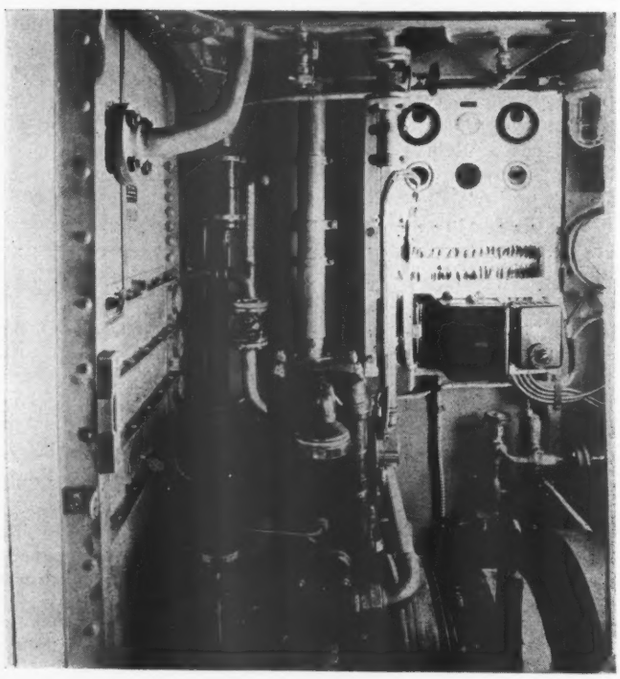
similar to American practice, the normal European method of bolting a wooden body to brackets attached to the side sills of the underframing is not employed. Instead, the steel superstructure with sheet steel end-walls is riveted to a sturdy underframe. To obtain great

Altek car under construction—Two layers of Dry-Zero blanket have been placed inside the outer layer of cork slab insulation

rigidity, the steel structure of the side wall is designed in the form of a girder connecting strong corner posts and a rigidly welded door frame. This has been done to enable the cars to withstand heavy shocks such as those encountered when carrying produce from agricultural districts where the railways may be in poor condition.

The side sills and center longitudinals, made from equal channel sections, rest on two I-beam cross members, which are supported by a trussing gear. These, together with the heavy head stocks and cross bearers, give the whole underframe great strength and rigidity. The beams of the outer roof are bolted to steel carlines which, in turn, are connected by angles to the superstructure. Thus, all stresses resulting from the weight of the car, from cargo load and from the shock of braking and switching, are taken up by the steel structure of the car, while the wood body members, pillars and rails, primarily are intended to hold the insulation in place and to support the inner shell of the car.

The interior of the car is covered entirely with galvanized steel sheets. The use of timber for the inside



The Diesel engine and electric switchboard in an Altek refrigerator car

lining has been discontinued because wood absorbs odors and is susceptible to penetration of mould spores. All joints in the steel lining sheets and the screws fixing the sheets to the inner posts, roof beams and floor boards are securely soldered. It is, therefore, possible thoroughly to wash and steam out the interior of the cars and to render cargoes immune to contamination from merchandise previously carried, thus greatly broadening the variety of produce that may be transported in the same car.

The walls are insulated with 2 in. of slab cork and 4 in. of Dry-Zero blanket, the floor with 5 in. of granulated cork, and the roof with 7 in. of Dry-Zero blanket.

The siding and insulation are attached to the external steel framework. The outside sheathing is of composition or steel. Between the siding and slab cork are two layers of building paper. The outer post and rail are attached to the sills and the slab cork is set into the rectangular frames of this outer post and rail construction. The whole of this is then covered on the inside by a layer of building paper. Two Dry-Zero blankets 2 in. thick are next applied on the inner side. The entire

inside is then covered with a course of burlap and over that another course of building paper, the final lining being a galvanized sheet.

The doors are hung from the outside steel frame and have 6 in. of Dry-Zero insulation with four sheets of building paper, one against each wall and two between the blankets. The door frames are of light construction, and are inset with a spring wood strip covered with felt and canvas. The fastenings are of the Miner type.

The floor is composed of tongue-and-groove sheathing, covered with a water-proof canvas, upon which rests the floor framework. Into these frames are inserted 5 in. of granulated cork in rectangular burlap covers. Next comes a ¼-in. rubber membrane, which rises 8 in. up the walls, and lastly the metal flooring, which is soldered to the inside metal lining.

The roof carries 7 in. of Dry-Zero blanket insulation, and is designed to reduce heat transmission through the framing to a minimum. The inner series of roof beams is bolted to sockets attached to the inner framework of the walls; the metal lining is screwed to the inside of these roof beams. Between the roof beams and above the metal lining are laid a course of building paper and a blanket of Dry-Zero. Then, for the entire length of the car and over the roof beams, lining and sections of Dry-Zero, are laid two Dry-Zero blankets covering the entire roof area, which are secured by battons to the inner wood roof beams. Over these are placed the outer, steel roof beams which are bolted to the outside framework of the car. Between these come additional Dry-Zero blankets, laid transversely over the car. Lastly come the wood planking and outside canvas.

The sides of the car and the outer roof are made of tongue-and-groove American pinewood boards. All the roof boarding is covered with a bituminous roofing felt made in one piece. Under the inner roof of galvanized sheet steel is an air duct made of the same material. Air is drawn by a fan from the bottom of the car over the coils of the direct air cooler, passed down this air duct and blown through small holes into the cold chamber. The cold air drops evenly over the cargo to the grilled floor and is returned at the bottom of the bulkhead to pass again over the evaporating coils.

Altek cars are reported to have hauled more than 2,000,000 tons of perishables with a loss of only 1.6 per cent. This record has been made despite the fact that shippers often select the Altek cars to handle the most difficult type of ladings. For example, an Altek car carried without loss from Pietra Ligure, Italy, to London, 175 cases of a variety of peach that never before had been transported even as short a distance as to Milan without a 30-per cent to 50-per cent loss. The peaches carried by Altek arrived in London in excellent condition and all were sold. Choice game, such as hare and pheasant, shipped in Altek cars have repeatedly brought premium prices in European markets.

Electric Starting of Diesel Engines

By Frank Guillot*

IN the original designs of Diesel-electric locomotives the question of starting the Diesel engines was not regarded as containing serious problems; compressed air starting was adopted. The fact that air starting had long been the general method employed in starting stationary engines naturally brought this method to the fore in the design of the first Diesel-electric locomotives. It was, therefore, decided to use a small auxiliary air equipment for starting purposes only. This equipment consisted of a small compressor driven by a gasoline engine and auxiliary reservoirs with the necessary valves and piping. While this arrangement was passably satisfactory, it had certain disadvantages such as delays sometimes occasioned by failure to get the auxiliary engine running immediately, especially after long periods of idleness or in extremely cold weather, time required to pump air up to the required pressure, and other troubles usually likely in any equipment used a relatively small part of the time.

The necessity for carrying gasoline as fuel for this starting equipment was another decided disadvantage on a locomotive otherwise free from inflammable materials.

These disadvantages, each seemingly small in itself, were in the aggregate sufficiently annoying to warrant the adoption of a method which would afford greater ef-

* Locomotive Transportation Engineering Department, General Electric Company.

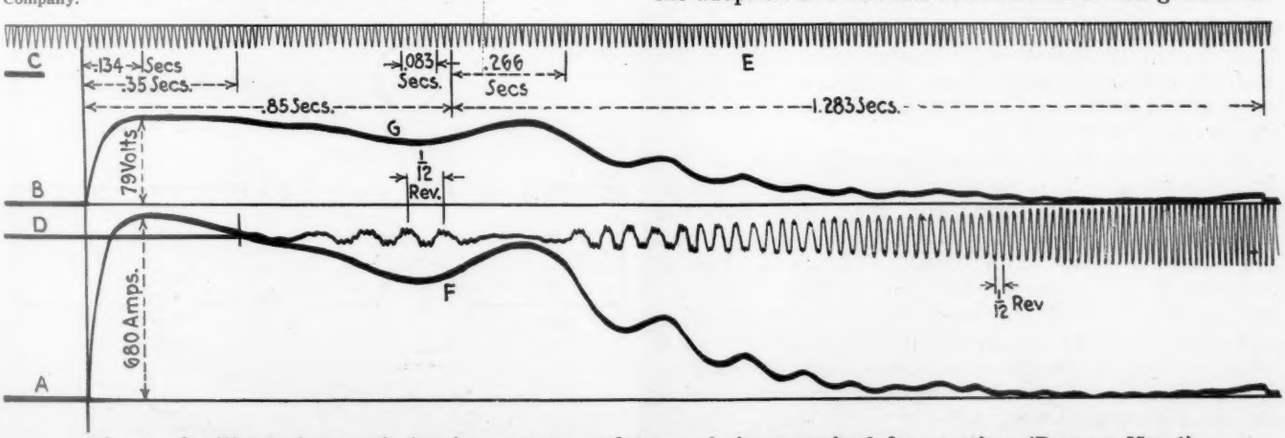


Fig. 1—Oscillograph record showing current, voltage and time required for starting (Battery No. 1)

ficiency through simplification as well as time required to get the locomotive under way. It was evident that the advantages of simplicity, ease of maintenance, and speed in getting under way could be accomplished by the use of electric starting.

Inasmuch as storage batteries were already carried on the locomotive for lights and control energy, it was merely necessary to increase their capacity and, as the switches required were of the same design as those already in use, the number of supply parts necessary was really reduced. It was necessary to add to the series winding of the generator to obtain the necessary starting torque when using it as a motor in starting the engine. The charging of the storage battery was accomplished through the auxiliary generator.

Some recent tests of the electric starting of a 300 hp., 6-cylinder, 4-cycle Diesel engine, wherein the records were taken by means of the oscillograph, brought out details of the actual requirements of power and starting time. When it is considered that the time cycle of starting ranges from 1½ seconds to 2¼ seconds, when the engine is warm, and the current, voltage and time values are given for each fraction of a second during this cycle, it will be seen that accuracy of result is obtainable, which would not be possible if recording or direct reading instruments containing damping features are used, where the limited speed of the human eye must be depended on to observe rapidly changing results.

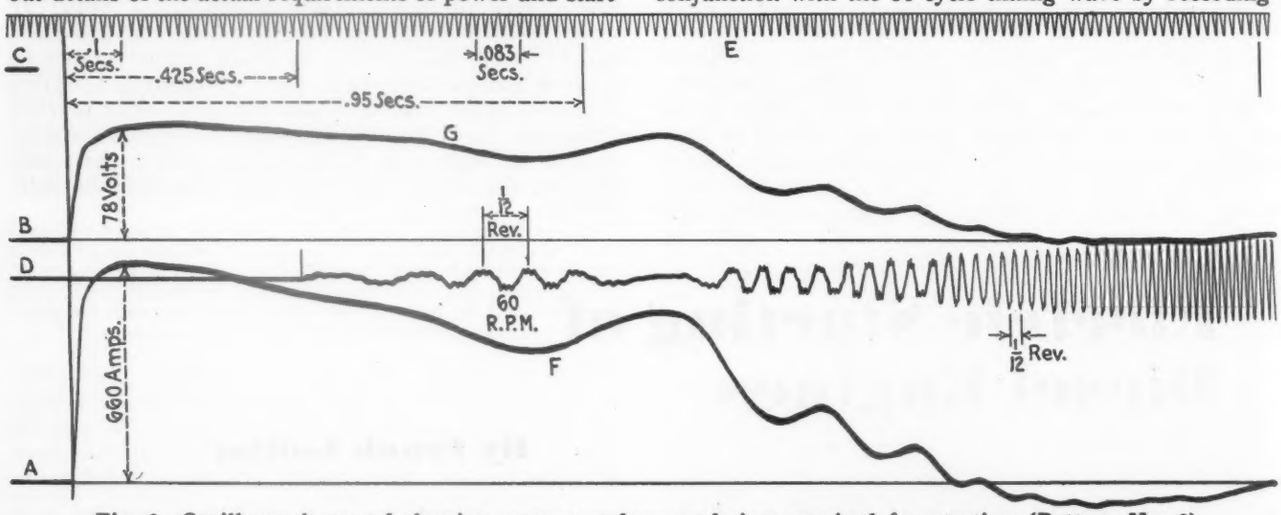


Fig. 2—Oscillograph record showing current, voltage and time required for starting (Battery No. 2)

Oscillograph records of tests using different type batteries are shown in Figs. 1 and 2. The line *A* in Fig. 1, indicates zero amperes, *B* zero battery volts, *C* open circuit battery volts, and *D* revolutions of the speed indicating alternator. The vertical lines at the top of the record indicate the 60-cycle timing wave. When the starting motor is thrown across the battery, the rise of current and corresponding drop in voltage are indicated in curves *F* and *G*.

A simplified sketch of the connections used for the engine starting tests is shown in Fig. 3. Two different batteries were used during the tests, and from the diagram, it may be seen that the voltage measured was that across the battery terminals. Curves *G*, Fig. 1 and Fig. 2, therefore represent drop in battery voltage, with increase of load, a measure of battery performance. Open-circuit battery voltage is approximately 114. Thus when the battery voltage drop is 79, as indicated in Fig. 1, the voltage across the terminals of the generator, which acts as a starting motor, is 35.

When the starting switch is closed, the increase of power is continuous until the engine starts to move. For calculating purposes, the point, at which the engine starts to move, is taken as the breakaway value, at which point the current reached 680 amp., the reduction in battery voltage, 79, and the voltage available across the terminals of the starting motor, 35.

The time from the moment current was applied until the engine started to move was .134 sec. From this point the current begins to fall until the first compression stroke is encountered, at which time the current begins to rise and continues to go up until the piston reaches approximately top dead center on the first compression stroke when the current falls and voltage increases until the next piston starts its compression stroke, and so on.

The revolutions were recorded by means of a small alternator geared to the crank shaft of the engine in the ratio of four to one. The speed may be calculated in conjunction with the 60-cycle timing wave by recording the cycle wave of the alternator, which is a six-pole machine. Each revolution, therefore, gives three cycles, and as its speed is stepped up in the ratio of 4 to 1, 12 cycles of the wave represent one revolution of the engine, or the distance between crests $\frac{1}{12}$ revolution.

Observing the revolutions line, *D*, it will be noticed that the line remains straight for a period of .35 sec. after the circuit has been closed, when it begins to take on the form of a wave. This is the point at which the speed has increased sufficiently to cause the revolutions indicator to register. From this point on, the wave gets more pronounced and the distance between crests decreases, indicating increased speed until the firing

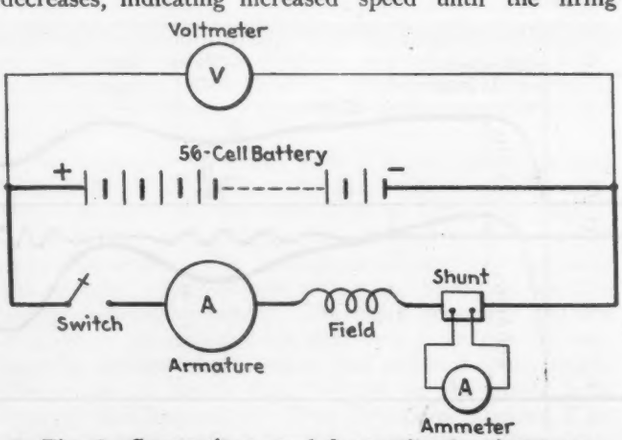


Fig. 3—Connections used for engine-starting tests

point is reached. A maximum speed of 60 r.p.m. is obtained while the engine is being motored, at which speed firing begins, which is in .85 sec. after the starting circuit has been closed. Observing the revolutions wave a distance of sixteen cycles of the timing wave, or about .266 sec. after firing begins, it will be seen that the engine speed decreases at the moment of firing. Fuel injection starts a few degrees before the piston reaches top dead center on the compression stroke. At the low speeds used for starting, combustion begins before top dead center is reached, which momentarily retards the speed. This condition decreases as the speed increases, injection being timed for proper combustion at normal speed.

After firing begins the speed rapidly increases to 257 r.p.m., which is reached just before power is cut off the starting motor, which occurs 2.133 sec. after power was applied.

In most cases the engine would continue to run if starting power were cut off immediately after the engine starts to fire, but in this case the control is arranged to require the starting circuit to remain closed until the engine has reached a sufficient speed to build up a predetermined lubricating oil pressure. The reason for this is that the engine is protected against low lubricating oil pressure by means of a switch in the control, which is operated by oil pressure. The function of this pressure switch must necessarily be annulled during starting, which is accomplished through interlocks on the starting contactor.

Streamlined Rail Car on Great Western in England

THE Great Western Railway (England) has recently placed in service a streamlined rail car driven by a 130-hp. heavy oil engine, which resembles in appearance a seaplane float. It was developed as a result of wind-tunnel tests which, it is said, indicate a reduction of the head-end wind resistance to one-fifth that of a similar flat-ended car. The new car will operate experimentally in local services and will cover about 218 miles a day.

The car is 62 ft. long and 11 ft. 4 in. high. It weighs 20 tons and has been designed for a maximum speed of 60 m.p.h. Seating capacity is for 69 passengers. The car is driven by a 130-hp. heavy oil engine using non-inflammable fuel. This engine is almost identical to those fitted in some of the London buses.

The sides of the car extend to within a foot of the track so that practically the whole of the vehicle, including wheels, is enclosed in a streamlined body. Everything possible has been enclosed, even to the head and tail lamps, controlled from the driver's seat, which are fitted flush with the body.

The engine, radiator and driving parts are located under the floor on one side of the car near the middle doorways, and can be easily inspected or repaired by merely removing an inspection cover.

Transmission of power from engine to wheels, and brakes and controls, which are duplicated so that the car may be driven from either end, are identical to those used on a great many of the modern cars and buses.

Interior of the Car

The entrance to the car is at the center, through double doors which open into a vestibule 5 ft. wide. Two large compartments lead off from this, each with a center gangway. On each side are seats ranged back to back, upholstered in pleated brown leather and fitted with cellular rubber cushions to give the maximum amount of comfort. Racks for light articles run along the side of the car.

The interior is decorated in brown and green. The sides of the car are covered in mottled green Rexine and the roof in cream Rexine. The floors are covered with Insulboard to deaden noise, and green lino and mottled green carpets. All the woodwork is walnut. Flush-fitting ceiling lights and lights on the under side of the luggage racks are provided. The coach is heated by hot-water heaters fed from the radiator. There is an emergency lever which stops the engine and applies the brakes when pulled down. Each compartment is fitted with a clock and speedometer. A microphone enables the guard to communicate by loud speaker either with the operator or the passengers.

The car is decorated in the company's colors—chocolate and cream. A crest appears at each end and on either side are the words "Great Western."

Streamlined rail car in service on the Great Western Railway, England

EDITORIALS

Fighting To Get Back Business

To railway men there can be no more inspiring spectacle than the splendid fight that is being made by the railroads to regain both passenger and freight business. This should mean much to the employees of the mechanical department in improved employment and more stabilized conditions. The depression was bad enough, but with it the railways have had to suffer severely from competition on the part of highway and waterway carriers, who, unhampered by the restrictive regulations to which the railroads are subjected, have also had their rights-of-way provided and policed for them by the government, whereas the railways have had to pay heavy taxes on rights-of-way which they have had to furnish and maintain at their own expense.

Much to the consternation of the motor-transport carriers, the railways have in several instances adjusted their rates in the attempt to meet this unfair competition. They have also speeded up their freight services and in some places are providing pick-up and store-door delivery service. While, under the business conditions which have existed in recent months, it is difficult to determine the value of these measures, there seems to be no doubt on the part of railway executives but that they are being effective in regaining business and strengthening the position of the railways.

Fast freight trains, such as the "Maine Bullet," which operates over the Boston & Maine and New York, New Haven & Hartford between Portland, Me., and New York; the "Speed Witch" of the New York, New Haven & Hartford and the Pennsylvania, which furnishes overnight service between Boston, Mass., and Baltimore, Md.; the "Blue Streak" of the St. Louis-Southwestern, and the "Katy Comet" of the Missouri-Kansas-Texas, operate on schedules closely approximating those of passenger trains, and are largely relieved of intermediate terminal delays. Because of this speeding up it is of first importance that the equipment be kept in such prime condition as to avoid possibilities of delays in transit. The mechanical department, therefore, has a real responsibility in doing its part in helping the railroads successfully to meet and overcome the competition of the motor transport and waterway carriers.

Signs of Distress

Signs of the strain created by the drastic retrenchments in expenditures for maintenance of equipment during the depression are clearly evident in the twenty-second annual report to the Interstate Commerce Commission of the chief inspector of the Bureau of Locomotive Inspection covering the fiscal year ended June 30, 1933, which has just been issued. The percentage of steam locomotives inspected which were found defective has been declining steadily for several years. From 24 per cent for the year ended June 30, 1928, it had dropped to 8 per cent for the fiscal year ended June 30, 1932. For the past fiscal year it rose to 10 per cent. The number of locomotives ordered out of service, the total number of defects found, the number of accidents and the number of casualties all have likewise increased for the first time within this period, although the number of locomotives for which reports were filed and the number inspected are the smallest for any year within the period.

The number of accidents caused by parts of the steam locomotive increased from 145 to 157, or 8.3 per cent, while the number of resulting casualties increased from 156 to 256, or 64.1 per cent. That this apparently alarming increase in casualties is not truly an indication of correspondingly alarming equipment conditions, however, is clearly evident from the fact that 102 injuries and three deaths were among nonemployees, as compared with six injuries only during the preceding year. Thus, only five employees met their death in steam locomotive accidents in 1933 as compared with nine in 1932, and 154 employees suffered injuries as compared with 150 during the preceding year. The large increase in nonemployees is due in the main to a single accident in which 84 passengers were injured by blowing steam and broken glass.

The report does not, therefore, indicate an immediately alarming increase in the number or nature of the defects, accidents, or casualties. Some apprehension may well be felt, however, from the fact that for the first time since 1923 the trend has reversed and conditions are definitely worse than for the preceding year. Without an increase in maintenance programs, irrespective of the trend in the volume of traffic handled, these conditions may be expected to get steadily worse. It is evident that locomotive conditions are approaching the danger point.

Honesty— Code or Character?

Among the prolific crop of proposed codes of fair competition which are being engineered through the N. R. A., many of which are now awaiting the President's signature, are a goodly number which have been prepared for the regulation of various branches of the railway supply industries. When all of these codes have met their final approval and become effective, railway purchasing officers will, for a while at least, have a busy time getting clearly associated with each of these groups its own particular variety of unfair practices, of which it proposes to purge itself through the administration of its code authority.

The provisions regarding sales and unfair trade practices written into the respective codes reveal some of the evils which have crept into the relation between these manufacturers and the railroads. Some codes contain no reference whatever to practices affecting the relations between seller and buyer. Others reflect the attempts on the part of the industry to relieve itself of pressure on the part of the buyer to secure provisions in contracts which may be considered entirely ethical even though not highly advantageous to the seller. Still others frankly aim at practices which not only must be considered unethical under any reasonable standard of business ethics,

but which also involve deliberate corruption of government representatives or trusted representatives of the purchaser.

It is a sad commentary on the business relations between some of these industries and the railroads that provision against corruption in specific terms has to be written into their codes of fair competition. It must be said also that falling back on regulations which have the force of law can never be a satisfactory substitute for common honesty in business relations. The latter can only be maintained when honesty as the basis of personal conduct prevails among the men in both the buying and selling industries. Indeed, regulations, imposed from without where personal standards of conduct should prevail, tend further to remove conscience as a factor in business conduct and substitute for it—sharp practice.

Problems of Supervision

The past four years have taken heavy toll of officers and foremen in the mechanical departments of the railways. In the natural course of events a certain percentage of these men would have been retired from active service because of old age, failing health, death, or other reasons. As a matter of fact, this percentage, even under normal conditions, would have been reasonably high, because most of the men in such positions are fairly well advanced in years. Even during the years immediately preceding the depression, however, the supervisory forces of many roads were being disturbed by shifts and eliminations caused by the more intensive utilization of locomotives, including the longer runs which eliminated or decreased the load on some division points and placed a greater emphasis upon enginehouse operations and running repairs. This tendency was further intensified by the centralization of heavy repairs to equipment in a smaller number of shops.

On top of this came the heavy falling off in business in the years 1930-33, inclusive, during which time many supervisors were demoted or furloughed. Some of these men, unfortunately, will never resume their former positions. A certain percentage has gone into other lines of work entirely outside the railroad field and cannot be induced to return to railroad service. Others, for a variety of reasons, will either not return to railroad service or will not be put back into their former positions. It is not surprising, therefore, that today, even with only a reasonable pick-up in business, questions, of which the following is typical, are challenging the attention of the mechanical department executives: "How can we best coach and train the supervisors who are new to their positions on how to render the most satisfactory service?"

No one other administrative question has been brought so forcefully to the attention of the editorial staff of this publication during the past month. We talk much of the "new deal" in economic, social and political affairs. The railways, likewise, are facing new and changed conditions. They will have to fight to the very limit to increase the efficiency of operation, in order successfully to meet competition from other types of carriers. It is more or less generally recognized, also, that still higher standards of freight and passenger service must be attained. This will require a maximum of managerial ability on the part of all departments. Indeed, it promises to require a standard of ability and loyalty on the part of the supervisors far beyond anything that has been expected in the past.

This problem of increasing the effectiveness of supervision is not a new one; indeed, it has been very much to the forefront during the past quarter of a century, as will be evidenced by a survey of the past volumes of this publication. We have had much to say about foreman training, including special courses of study, staff conferences, foremen's and supervisors' clubs, etc. Several roads in recent years have approached the problem in different ways and with excellent results, even though in most instances such activities have been dropped or have lagged somewhat during the past two or three years. Excellent facilities of various sorts are available for those who realize the emergency and have the will to take advantage of them.

Then, too, although the railroads differ materially in most of their operations from the average industrial organization, valuable suggestions may be gained by studying the practices of the more advanced of these industries in improving and strengthening their supervision and increasing production. Certain of these industries have secured excellent results by going outside their organizations to secure expert advice and counsel; others have deliberately selected and trained carefully picked men to specialize on problems of management and production. Just as it is important periodically to dress and sharpen tools, so it is equally, if not more important, methodically and scientifically to study and take measures to bring the supervisory staff to the best possible condition satisfactorily to discharge its duties. This is true even under normal conditions, but is particularly so—as conditions change and competition becomes more intensive.

Do We Know Our Unit Costs?

We hear a lot of discussion from time to time about the vital necessity of reducing the cost of repairing locomotives but almost every time one makes an attempt to reduce the discussion to practical facts and endeavor to arrive at some conclusion as to what moves should be made to bring about such a desirable objective there appear to be so many varying factors that it is extremely difficult to consider the problem in its entirety. Possibly the very fact that so many mechanical men try to look at the problem in all its phases is the reason why it appears complicated. Most any modern machine looks complicated in spite of the fact that it is actually made up of a number of comparatively simple parts. So it is with many modern problems. If we take them apart and examine the "pieces" one by one sooner or later the one shows up that is causing most of the trouble. To remedy the trouble once it is found is a relatively simple matter.

It has been stated before, and is worth stating again, that we are spending more money on the railroads of the United States for repairing locomotives than is being expended for any other single item of operating expense and, because it is the item of greatest expense, locomotive repair costs should logically demand the greatest attention in an effort to reduce them.

It may also be worth while to re-state the factors entering into this problem. Generally speaking there are four, all equally important and inter-dependent: First—the selection of the proper type of locomotive to meet the demands of the particular service for which it is to be used; second—careful locomotive design with a view to efficient operation and economical maintenance; third—adequate repair facilities of a type that will permit the

repair of power in keeping with the demands of traffic and at the lowest possible cost and, fourth—a broad appreciation of the importance of this problem on the part of railroad officers and supervisors; in other words, intelligent management.

A few months ago, in an editorial in these columns, this problem was discussed and the suggestion was ventured that the railroads had not made the progress in reducing repair costs that should have been made. One railroad officer took issue with that suggestion and said that, in his opinion, we were unfair in not giving the railroads credit for the accomplishments that have actually been made over the past ten or fifteen years. Unappreciative as it may seem of past accomplishments the cold fact stands out that, regardless of what has been done in the past, the mechanical department of the future is going to have to do many things that have never been done before and do them in an entirely different way. The policies and achievements of the past have been based upon the revenues of an expanding industry—the decisions of the future, in all probability, will have to be tempered by the knowledge that the period of rapidly increasing revenues has ended.

Those mechanical officers who do not hesitate to look into the future are gradually becoming convinced that possibly we do not know as much about the economics of the problem of locomotive repairs as we should. Questions arise daily to which there appears no immediate answer and, what is more disconcerting, concerning which there appear to be no tangible facts on which to base a conclusion. Is it possible that many of the major problems of the past have been solved by more or less rule-of-thumb methods? Is it possible that we have achieved successes in the mechanical department primarily because, up to now at least, the revenues of the industry have usually been more than sufficient to meet our needs? Possibly the reason why we haven't made greater progress is because we have, up to now at least, been denied the vitalizing influence of keen competition. Be that as it may, the railroads are now faced with competition and the mechanical department, because its expenses represent the largest items in the budget, is going to have to meet a logical demand that it find ways and means of reducing those expenses.

It would seem ridiculous to suggest that any mechanical-department officer does not know from year to year and month to month what the comparative costs of operating his department are. Without a doubt they all do. Suppose we were to go a step farther and ask whether one class of locomotive on a given railroad is more economical to operate than another—assuming that they are both capable of hauling the same tonnage over the same territory. Most mechanical officers—not all—can answer such a question as this. If you were to attempt to state, without fear of contradiction, that one shop on your road is more efficient than another or than one on another road the answer would become more difficult. Assuming that you know that one type of locomotive in a given service is more economical to operate than another, can you state with positive assurance why this is true and can you state with equal assurance what should be done to correct the condition on the type that does not show up so well in service? Is it possible on most railroads to produce records showing the comparative repair costs of individual locomotives over a period of, say, 10 years?

The only excuse for injecting such questions as these into a discussion of the locomotive repair problem is that attempting a frank answer to them may lead to the discovery that the railroads have, in the past, done a rather thorough job of keeping comparative cost records *in a general way* but have apparently been satisfied that a detail knowledge of unit costs is not necessary.

How can intelligent decisions as to future repair programs be made without an intimate knowledge of the actual costs in connection with every part of every locomotive on the line? Such a knowledge is required in order (1) to select the proper type of locomotive for a given service, (2) to design with a view to efficient operation and economical repairs, (3) to determine whether the repair facilities are adequate for the demands of traffic at the lowest possible cost and (4) to make it possible for management to be intelligently applied. If this be true then unit costs, compiled in greater detail than has heretofore been the practice, are the key to open the door to lower costs of locomotive repairs.

NEW BOOKS

A. S. M. E. Power Boiler Code, 1933 Edition. *Published by the American Society of Mechanical Engineers, 29 West Thirty-Ninth street, New York. 314 pages, 5½ in. by 8 in. Bound in cloth. Price, $2.50; to members, $2.*

The A. S. M. E. Boiler Construction Code comprises eight sections. In this volume are included but three sections which pertain to the construction and inspection of stationary boilers for the development of power. These are: Section I, Power Boilers; Section II, Materials Specifications, and Section VI, Rules for Inspection. Stationary boilers as here considered include portable and traction boilers. The Code applies only in part to certain special forms of boilers, such as those of the forced-circulation or flash type. Suggested rules covering existing installations are included in the Appendix, which is explanatory, and not mandatory, in enforcing the rules of the Code. The rules for the inspection of materials and boilers (Section VI) are suggestive only and do not form a part of the Boiler Code.

The Book of Stainless Steels. *Published by the American Society for Steel Treating, Cleveland, Ohio. 631 pages, 6 in. by 9 in. Board binding. Price, $5.*

Part 1 of this book describes the Production and Fabrication of heat-resisting and corrosion-resisting alloys; Part II, Properties of the Typical Alloys; Part III, Requirements of the Consuming Industries, and Part IV, Classification of Trade Names. Each of the chapters has been written by an outstanding engineer in the particular branch of the industry, among the authors being E. J. W. Ragsdale, research engineer, Edward G. Budd Manufacturing Company, who discusses Spot Welds and "Shotwelds."

Introduction to Railway Mechanics. *By George V. Lomonossoff, D.Ing.E.h., M.I.Mech.E., M.V.D.I.; formerly professor of railway engineering and economics in Kieff and St. Petersburg, and research associate of the California Institute of Technology. Published by the Oxford University Press, 114 Fifth avenue, New York. Price, $3.75.*

This volume of 180 pages presents in slightly altered form the subject of a series of lectures at the California Institute of Technology. It applies mathematical analyses to the various problems of motion as they affect railway track and equipment, such are: Motion of the Wheel; Propelling and Resisting Forces; Railway Track; Railway Vehicles; Motion Along Curves; Locomotives; Parasitic Motions; Mechanics of a Train and Dynamics of a Wheel.

THE READER'S PAGE

Answers Reader's Questions

To the Editor:

On The Reader's Page of the November *Railway Mechanical Engineer,* under the title of "What Is Your Opinion?" a reader raises the question as to whether it is permissible to re-light-weigh and restencil foreign cars and bill owner. The correspondent specifically mentions a steel-underframe car with wood superstructure and designates the first reweighing when the car is one year old. Of course, there would be no difference as to whether it was the first or any subsequent reweighing, nor the class of car, except as provided for in section (1) of Rule 30.

Rule 1, paragraph (a), says: "Each railroad is responsible for the conditions of all cars on its line." Rule 30, first paragraph, section (B), says: "All freight cars, except as otherwise provided in section c, must be re-light-weighed and restencilled periodically as follows * * *." (Then follows the classification of cars and the time that may elapse between reweighings. The exceptions otherwise provided in section (C) are tank cars and live poultry cars.)

Rule 30, section (G), first paragraph, says: "When a car is reweighed and restencilled the owner must be promptly notified of the old and of the new light weights and load limits and the place where and date when reweighing and restencilling was performed. The proper officer to whom these reports should be made will be designated in The Official Railway Equipment Register."

Rule 107, Item 284, says: "Weighing and stencilling all per-diem cars, net—$4.15."

The rules do not specifically state that foreign cars may be reweighed and restencilled and bill made against owner for same, but all references to the matter indicate that it is a proper practice. Furthermore, it often becomes necessary to do this. A car may leave its home line just before it is due to be reweighed and remain away for many months. It would be impractical to allow it to go without the proper attention in this regard and it is not being done. So, your car away from home with the weight stencilling out of date is any man's meat.

Second question, "Can foreign cars be sent to the repair track for air-brake cleaning after 14 months, or must the 15-months' limit be used if the brake is not defective?" Section (b), Rule 60, as revised in Supplement 1 to the 1933 A. R. A. Code, says: "Cylinders and triple valves not cleaned within 15 months, as indicated by standard markings, must be cleaned. After the expiration of 12 months, if the car is on the repair track for other work, the air brakes may also be cleaned. After the expiration of 14 months, air brakes may be cleaned regardless of whether or not car requires other repairs."

Of course, this refers to foreign cars, as there is no restriction on performing this work on home cars, provided they are not allowed to run over the 15 months.

The charge for this work is $4.73, as per Item 13, Rule 111.

T. J. Lewis.

[Note.—Car Service Rule 11, of which Interchange Rule 30 is a reprint, was revised, effective January 1, 1934, in that portion of Paragraph (1) Section B which pertains to the re-weighing of cars. This was done for the purpose of synchronizing the dates for the re-weighing and stenciling with those for the cleaning of air brakes and the repacking of journal boxes. Attention is directed to this revision in connection with the second paragraph of Mr. Lewis' letter.—Editor.]

Heating 18-Car Trains

To the Editor:

In the November, 1933, issue of *Railway Mechanical Engineer* there appears an article by W. J. McClennan with reference to the possibilities of heating an eighteen-car passenger train:

It has been the writer's experience, in connection with the design of steam heating equipment for heating of trains drawn by electric locomotives, that the limitations at present imposed by virtue of size of steam-heat train-line pipe (2 in.) and the size of connectors between the cars determine the length of train that can be properly heated.

It has been observed that approximately 20 lb. pressure drop occurs between the pressure reducing valve at the locomotive and the train-line connector at the rear of the tender or electric locomotive. Further, in order to assure reliable steam flow through the train, the steam pressure at the end valve of the train must be not less than 5 lb. The pressure drop experienced throughout the train depends upon the outside temperature and train speed and will range from 12 lb. to 20 lb. per car.

It has been found that, with a given initial steam pressure at the head end of the train, the pressure drop throughout the train increases rapidly with train speed, as indicated in the McClennan article. This is due to the excessive condensation experienced at the connectors because of wind velocities at these points due to train speed.

For trains made up of from twelve to eighteen 70-ft. day coaches the maximum quantity of steam that can be put back through the 2-in. steam heat line is represented by

$$S = N\left(4.31 - \frac{N}{12.5}\right)$$

where S = total steam to train, pounds per hour.
N = number of day-coach cars in train.

The pressure drop through the train is represented by equation—

P = 0.7W — 4.97 for eighteen 70-ft. day-coach train.
P = 0.546W — 4.69 for fifteen 70-ft. day-coach train.
P = 0.40W — 10.0 for twelve 70-ft. day-coach train.
P = pressure drop.
W = steam consumption, pounds per car hour

On the basis of the above data, it will be seen that, where the car consumption rates approximate 350 lb. per car hour, due to severe weather conditions, not more than twelve 70-ft. day coaches can be handled with the present 2-in. steam-heat line. Also, that where eighteen-car trains are to be handled, the hourly steam consumption rate per coach must not exceed 225 lb. per car hour, thereby indicating that the limit of ability to properly heat trains is based on quantity of steam that can be handled through the steam heat train line.

Robert N. Miller,
Assistant Engineer, Pennsylvania.

With the Car Foremen and Inspectors

Alec and Dave Are Back Again

By T. J. Lewis

DAVE was busy on his interchange the other morning when he heard Alec call:

"Dave! Come here a minute."

"Wait a minute," Dave answered.

Dave was going that way anyhow and he could tell by the sound of Alec's voice that it was something out of the ordinary that Alec wanted him to see, so he'd take his time and aggravate Alec a little. Dave was inspecting his interchange cars as he went, and glancing in Alec's direction, all he could see was the rear end of Alec protruding past the side of the car.

Dave took his own time and when he came up to Alec, leisurely asked:

"What seems to be the trouble, old man?"

Naturally, Alec felt just a trifle of resentment at Dave's lack of interest and blurted out:

"I'm just setting one back to you for a loose wheel, that's all."

Dave pretended great surprise. "Loose wheel," he yelled. "Why, who ever heard of setting a whole car back just for one loose wheel." "Why, Alec, remember when you was a kid you used to cry to ride on your daddy's wagon—and all the wheels it had were loose?"

"Well enough," said Alec, "but this old wagon of yours is not going to ride on this road with one loose wheel."

By this time Dave had arrived at the car in question and glancing at the sealed door, then at the Inter-Road ticket on the corner of the car said: "Uh huh, loaded car too, Alec. Why is it you always want to pick out loaded cars to find trouble with? Now there's that old empty right next with your O.K. mark on the corner. I'm asking you, if you just had to set a car back, why couldn't you find something the matter with it and set it back and let the load go?"

While Dave was "ragging" Alec in this manner, Alec was still down on his knees, over the wheel, squinting at it, inside, then outside, doing his best to determine if the wheel was really loose. He realized that Dave was trying to "get his goat" and, of course, that made it easier to do. Dave, for his part, knew just as well, or better, than Alec did, just how much of that sort of stuff would be required to find the end of Alec's temper, so he made no immediate move to look at the wheel himself, but stood aside and continued to prod Alec.

"Business is business, you know, Alec," he said. "Loaded car is real business, empty may be or may not be, so you better think again——."

"Who the devil could think," Alec growled, "with all that racket going on? I know what I am going to do about this wheel——"

"O, well, then why did you call me down here," Dave cut in. "Besides I was just going to suggest that it might be easier to change your mind than to change a pair of car wheels. More profitable too, maybe." "Course," he added, as an afterthought, "it depends on whether you got a mind to change."

"No," said Alec testily, "what you was just going to do was wait and see what my decision was and then you was going to try to decide different and undertake to make me agree with you unless my decision was entirely in favor of your old railroad, which is what you can decide right now, because I am giving the car back to you and, welcome."

"What?" Dave exclaimed in surprise. "Wait a minute, Old Timer, wait a minute. What in the world's the matter with you this morning? Has the Old Man been riding you with another hot letter? What you been up to now? Giving somebody else a defect card for brake shoe keys, or something? Ha, ha, ha," Dave laughed. He knew he'd touched a sore spot in Alec's mind that time.

"O, never mind all that," said Alec, "here's your car. You can do what you please with it, and when you make it safe to handle, give it back to us and we'll run it. Don't want to see it any more 'till then."

"Huh!" Dave snorted, "is all that so? All just because that wheel looks a little like it might be loose and maybe a little more like it might not be loose, huh."

"Depends on who's doing the looking and how contrary they are I guess," Alec answered.

"O, well," said Dave, getting down to take a good look at the wheel. "Does look a little like it might be leaking a little oil through the hub, don't it?" "However," he continued, "that's the only indication in the world you can see. It's not out of gage and the best you can see behind the journal box it looks all right to me."

"Sure, it looks all right to you because it's going from you or is wanting to," Alec rejoined, and continued: "Did you ever notice, Dave, how much better a disagreeable thing looks going from you than coming to you?"

"O, yes," said Dave, "a bull dog, f'instance."

"How about a car with a dangerous defect?" Alec asked.

"Same thing," Dave mumbled, still on his knees, looking at the questionable wheel. A thought struck him and he quickly turned and said: "Now if that blamed car you mentioned was in my out-bound train it'd be mighty different. A defect card's sorter like that too."

"Well, you're not doing any good squinting at that wheel," Alec reminded him.

"Really, Alec, I believe I'd run that wheel," Dave began.

"No use to start any argument, Dave," Alec bridled. "We're not supposed to try to use any judgment of our own in a matter of this sort. In fact we're not supposed to have any judgment to use—the office folks who never see any car wheels have that. Our job is to do the looking and if we see oil on a wheel-fit we're to assume that it is probably loose and if it's probably loose it's probably dangerous, so there it is."

"Wait a minute," Dave said. "This is a truck defect and it's up to you to run it, repair it or transfer it, just which ever you please. I haven't forgotten that damned old empty you folks delivered on my track with a broken wheel flange, and when our switcher pulled it out, it derailed and fell over and knocked a hole in one

of your old cars and I had to give you a defect card for the damage. No, sir! You'll not catch me in another mess like that. Besides, this wheel is half worn out and, no doubt, been all over North America without causing any trouble. Now you want to condemn it just because it's got a little oil on it that gives you an excuse for trying to believe it's loose."

"Yes," said Alec, "but Dave, that was different. In that other case it was your own empty car that had to go home to you, was delivered on your own track with an owner's defect. Now this car doesn't belong to us,—it's just one you're trying to give us and it's not safe to handle and we won't have it."

"Safe enough I claim," Dave came back. "As I said, it has been everywhere else but here and this place is no different from others, counting contrariness and stubbornness out. If the wheel is loose as you want to claim, it's purely an owner's defect, delivered safe on your own tracks, so it's straight up to you to handle it any way you choose." Dave delivered this last shot with an air of finale that he intended to put a finish to the whole matter, and added, as he pretended to turn and start away—"that's all I've got to say about it, Alec."

"In that case," Alec growled, "I won't expect to hear a word from you about this." So saying, Alec flourished a "Set Back" card in Dave's direction and turned and proceeded to tack it on the car.

"Look here, Alec," Dave objected. "I haven't got a single pair of wheels of that capacity in my whole outfit, and I believe you knew it and are trying to set this car back on me, just in order to mess me up."

Alec had started to fill in the card, but as Dave said this, Alec turned and stood staring at him with a look of incredulity and after a moment said, "Why, Dave, I'm in the same fix. Course I've an order in for them, but it hasn't been filled. Don't know what's the reason, —haven't got 'em at the shop, maybe."

"Oh, that's what's making you so scary here in your old age, is it? Well, I'll tell you Alec, the fact that you haven't got the material with which to make repairs is no good reason for refusing to accept a car and by all the rules in the book this car belongs to you and you know it. Just turn right over here to the fifth paragraph of Rule 2,"—as Dave said this he had pulled his Rule Book from his pocket, thumbed the leaves over and was pointing a long, grimy finger at the paragraph in question—"it says right here, as plain as the grease on that wheel hub, that 'Loaded cars offered in interchange must be accepted, with the following exceptions (a) to (e), inclusive.' Now read from (a) to (e) and if you find anything about a loose wheel in 'em I'll eat 'em."

Dave considered that he had Alec on a hot-spot, and his argument, sure enough, was getting under Alec's skin; however, he was too well acquainted with his old adversary to hope that he would take the "count" so easy.

Alec realized that it was no time to let himself get out of hand, so, taking a moment in which to pull himself together, he said, in a tone of voice and with a glance that indicated that Dave's ignorance was hopeless, "Dave, you worry hell out o' me," and continued, "of course, I know it's not in the paragraphs (a) to (e), inclusive, but just turn right over there to page 13 and read Article 9 and learn something, if you can." As he said this he was getting his own rule book out, and turning to the place mentioned, read: "Any other defects which can be repaired under load, or if car is safe to run and safe for lading, the receiving line to be the judge."

Dave gave not the least indication that he heard, or that he even knew Alec was reading, so Alec persisted: "Hear that, don't you Dave, listen again, 'or if the car is safe, the receiving line to be the judge.'"

"Aw, go to hell," Dave snapped and turned away, as he chewed on a match stick to relieve his irritation. After a moment he said, "No danger in that car, Alec, and you know it."

"Don't know anything of the kind," Alec persisted, and continued, "the blamed thing 'ud have to go around a plumb new-moon curve to get to my rip track and that wheel would be hard against the rail all the way. I'm on the receiving end of this job and I don't propose to take any risk when I don't have to."

Their attention was attracted to a switch engine working just across in Dave's yard and Alec had a happy thought and said:

"Why, Dave, there's Joe making up his shop run now. Why not get him to back right in here when gets ready to go and pick this old patient up on the rear end and he can take it to North Yard Shop and your Old Man will put the wheel in and have it ready by the time Joe gets his shop switching done and he can bring it right back." And as an afterthought, he added, "Straight track all the way, too."

"Guess I better do that," Dave grumbled and strode off to see Joe about it.

So the trouble seemed to be over.

THE car did not get back that day as both boys had expected, but when they arrived at the interchange next morning, there it was, back on Alec's track. Dave was there first and when Alec walked up Dave said:

"Well, Alec, here she is, safe and sound with a new wheel in 'er. Hope you're satisfied now."

"Yep, everything's pretty," Alec admitted, but added, "see a little oil on that one too,—guess it got on there in the shop."

"Sure," Dave answered, "that pair of wheels were just fitted up yesterday. You know I told you the press had been broke down."

Dave felt that Alec should have a mild bawling out for his over-caution, so he proceeded with it this wise:

"Now that you've got it like you want it Alec, I just want to tell you a thing or two. I met Jim Hooks, the wheel-press man downtown last night and he told me,—what do you reckon? Why, he said it took over two hundred tons pressure to unseat that blamed wheel, as scared as you was of it. He said also that there was not the least bit of sign where any oil had leaked through that hub. Whaddayou think of that? You know Jim's a careful man too,—been on that job a long time. No, sir, you can't fool Jim about a loose wheel."

"O, well," said Alec, "nobody's trying to fool Jim, nor giving him any thought anyway. Jim's got his own job to attend to at the shop and ours are up here,—that's all the difference."

"You know, Alec, I told you all the time the wheel wasn't loose," Dave persisted, "and Jim said him and the shop foreman both agreed that it wasn't loose, before he ever put it in the press."

By now Alec was good and hot, so he snapped back, —"they did, did they? Well, then why in the hell did they ever put it in the press? Would you put a wheel in the press and take it off if you knew already it was not loose? Of course, you wouldn't. If they are so damn smart they ought to have our jobs and let us work in the back shop where we could afford to know everything and be responsible for nothing. Would them smart fellows be willing to tell the general foreman that

they pressed off a wheel for being loose that they knew already was not loose? No, and they'd have a duck fit if you told him so. I've always noticed that it's the yap furthest removed from responsibility that knows most and is the bravest about what he would do, if he was going to do anything at all, which he generally ain't. As for them smart fellers that make the rules for us to go by, if we go by 'em and don't take any chances then we're blocking business, but if we try to look the other way and let a thing pass and get the freight spilled all over the right-of-way, that's criminal carelessness and we're due to be discharged.

"So the way it seems to me, Dave, is that if you want to be on the right side, all the time, you just got to beat them guessing all the time which is, of course, impossible."

While Alec was unloading this, he had knelt down by the wheel and was closely looking at the bit of new oil on the hub, when, spat! a new drop of oil landed square on it.

"Well, I'll be damned!" he blurted, "look here, Dave, just com' ere, will you," and following the line with his eye, from the hub straight up to the car floor, he got an eye-opener.

By this time Dave was down on his knees also, looking up to see what it was all about. Alec reached up and slowly touched his finger to a small splinter that protruded straight down from the car floor, then looked at his finger and held it for Dave to see. It had a fresh drop of oil on the tip of it.

"Well, don't that beat anything you ever saw?" Dave asked, and continued, "Why, Alec, that's a nail hole through that floor. Yes, sir, some scamp pulled a nail out and this car is loaded with empty oil barrels and you know how they always leak oil all over the floor, and that's just what's happened. Well, I'll swear." They both got up and stamped around awkwardly and said nothing for a moment. They were about as cheap feeling a pair as could be imagined and could not keep it from showing in their looks.

Dave was never known to keep quiet for very long, so he said:

"Well, Alec, that's a good one on you, ain't it?"

"On me, hell," Alec exploded, "no more on me than it was on you and if you think so, just tell your Old Man about it and see what he thinks."

"Tell the Old Man nothing," Dave exploded. "What I've noticed is that he is too blamed wise already, without me telling him anything, 'specially about a job like this." As an afterthought, he added, " 'Course, I know you'll tell it everywhere, Alec, ha, ha."

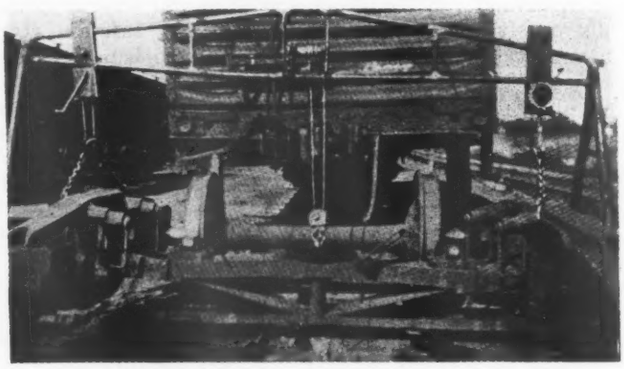
"Aw, you go to hell," Alec growled and turned slowly away to go about his work. He realized that he would feel better if he could get off by himself.

Car Truck Assembling Devices*

By W. J. McCloskey

THE weight of modern truck side frames and the importance of application at the proper angle in relation to the wheels presents a hazard to highly polished journals meriting the most skillful and conscientious handling. In one of our local shops we employ a comparatively simple device which suspends the bolster and carries both truck side frames free of the journals at right angles. The entire structure weighs about 80 lb. and is made largely of scrap material available at the local shops. This material consists of 1¼-in. pipe cut to the proper length and fabricated by means of welded joints, the lifting mechanism consisting of brake ratchets and dogs, also reduction gears salvaged from scrap 50-ton jacks.

This arrangement affords sufficient power to raise the truck parts with little effort on the part of the operator. The device eliminates the use of jacks in changing wheels with the exception of those used in raising the car; it reduces the operating time of changing wheels approximately 30 per cent; eliminates all damage to dust guards and the possibility of damaging the highly polished journal due to the truck side being removed or applied. It also holds the truck side in convenient working position to clean out boxes, remove or apply dust guards, and clean out well holes. The approximate weight of this device, as stated, is 80 lb. and it can easily be carried by two men to the point where the wheels are to be changed.



Device used in assembling car truck sides and bolsters easily and without damaging the journals

Frame and braces are made up with welded joints, either acetylene or electric, as local conditions warrant. The cross bar is level, while the top support is arched, and cross braces are welded in to give additional strength. Winches on the sides, that lift and carry the truck sides, are made up of discarded jack gears and dogged with a brake ratchet. These travel on the straight cross bar on a roller which, in this case, is an old sheave wheel. The cranks are welded on permanently. Brake wheels could be used in place of cranks, but would add to the weight. One-quarter inch wire cable is used down to the light chains that are coupled to the truck sides and bolsters.

This device is very sturdy as constructed and, by using the gear reduction, sufficient power is provided to raise the bolster and side frames at one time so the wedges, brasses and springs can be removed. We never think of maintaining any light jacks for truck work since these devices were installed. All the jacks needed for wheel changes are those used to raise the car.

*Abstracted from a paper entitled "Train Delays on Account of Hot Boxes," presented by W. J. McCloskey, general car foreman, Illinois Central, before the regular monthly meeting of the Car Foremen's Association of Chicago, held Monday evening, November 13, at the La Salle Hotel, Chicago.

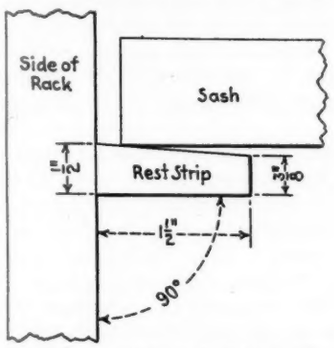
ANOTHER USE FOR OLD FREIGHT CARS.—According to the Wall Street Journal, several discarded freight cars standing on an unused sidetrack in upper Manhattan, N. Y., gave two women an idea. They secured permission to make these cars livable, cutting windows, finishing the interiors, and putting in each car a few plain articles of furniture. One car was fitted up as a kitchen and dining room where the women serve meals to their tenants—50 of them—at $6 a week for board and "room."

Sash-Rack Skid

THE adjustable sash-rack skid, shown in the illustration, has been used for several years at the Milwaukee passenger shops of the Chicago, Milwaukee, St. Paul & Pacific, to handle sash within and between the sash and door, trimming, etc., departments, and has given efficient service.

The skid has an overall height of 64 in., width, 39½ in., and length, 66½ in. It is designed for movement by hand or power lift trucks, accommodates various sized sash in a horizontal position, and can hold two different-sized sash on the same load. One man can handle the device.

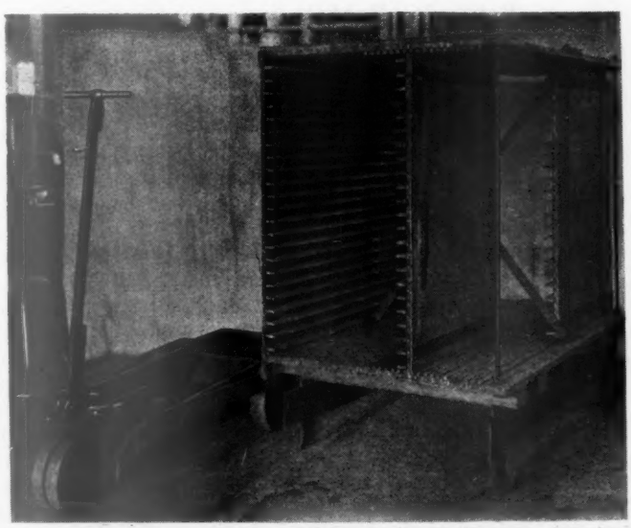
The base, or skid proper, is made of four wrought-iron straps bolted together. Two straps, each ½ in. by 4 in., are bent so that each strap forms two legs and a cross piece. Two other straps, ¼ in. by 6 in., tie the first two pieces together to form the skid, and also serve



Details of the rack side and skid rest arrangement

as side guides for the lift truck. The rack proper is bolted onto the cross members of the skid.

The rack is an open-ended box, consisting of top, bottom and two sides. It is made of tongue-and-groove wooden flooring and sheathing, and is 46 in. high, 39½ in. wide and 66½ in. long. One side of the rack is made



Sash-rack skid used at the Milwaukee passenger-car shops of the C. M. St. P. & P.

into two independent parts, each part or semi-side 32½ in. long, and it can be pulled out and slid into any one of the 17 grooves to provide proper spacing for the sash. Three ⅝-in. diameter rods support the top of the rack on the side that has the two semi-side pieces. Also, two ⅜-in. by 1½-in. wrought-iron straps, criss-crossing each other, placed inside and at the center of the rack, help to keep the rack rigid.

The inner walls on each side of the rack are covered with tin to prevent the metal edges of the sash from damaging the rack and thus getting dirt onto newly-painted sash. The wooden strips upon which the sash rest are screwed onto the sides of the rack. Each strip is cut on a bevel, as shown in the sketch, so that only an edge of the sash rests upon the strip, thus minimizing the damage to freshly-painted sash. The strips are spaced so as to accommodate sash up to 1¼-in. in thickness.

The rack, shown in the illustration, holds 44 sash, a complete car set of inside or outside sash. It will hold sash varying in width from 15 in. to 34½ in. A larger-sized rack skid, similar in design to this one, is employed for the wider sash found in dining and parlor cars.

The sash-rack skid is designed to afford a maximum protection for the sash, plus a minimum expenditure of labor for handling. When the sash is painted it occupies a horizontal position on the bench or in the spray booth. By having the sash occupy a horizontal position in the skid-rack, they are more easily handled because unnecessary turning is eliminated. The horizontal position also prevents "runs" in the paint and varnish while the sash are drying. The sash are better protected against dirt, dust and damage when enclosed by an open-ended box, and yet plenty of air is afforded for the drying of paint and varnish. Having the rack capable of accommodating various sized sash, and two sizes in one load, permits full utilization of each rack-skid, and minimizes the number of skids and shop floor space required.

Pertinent Questions On Hot Boxes?*

1—Do you make special efforts to detect cut journals in cases where they are cold when inspected, and there is no exterior evidence of recent heating?

2—What action do you take in cases where journals are discovered cut with no evidence of recent heating and running cool at the time of inspection?

3—What disposition do you make of so-called cold cut journals discovered in connection with regular service treatment on your repair track when there is no evidence of recent heating?

4—How do you decide whether or not a journal bearing on a cold journal is sufficiently defective to warrant removal? This applies to train yard inspection and not Rule 66 service on repair track.

5—Do you condemn journal bearings on account of what appears to be excessive end wear? If so, what is your condemning limit?

6—Do you, in connection with service treatment on repair tracks, condemn journal bearings found with cracked lining which apparently adheres tightly to the shell?

7—Do you inspect for waste grabs in train yards? If so, how do you proceed toward detecting it?

8—What method of servicing journal boxes in terminal train yards, etc., do you consider most productive?

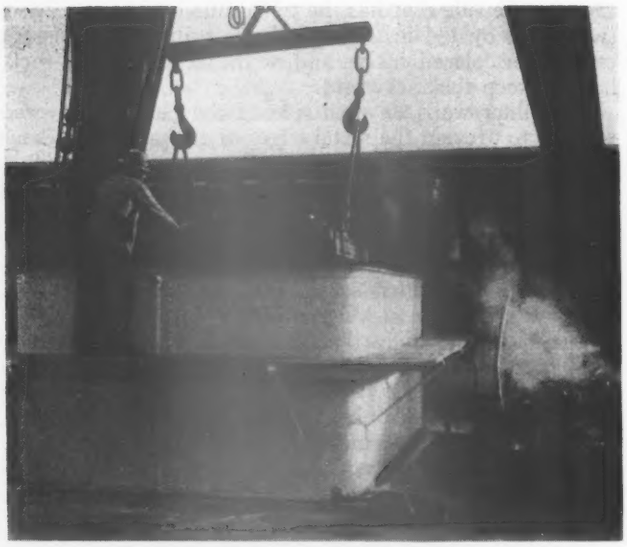
9—To what extent is free oil used in your train yards?

(*Concluded on page 26*)

*These questions were appended to a paper entitled "Train Delays on Account of Hot Boxes," presented by J. W. McCloskey, general car foreman, Illinois Central, before the regular monthly meeting of the Car Foremen's Association of Chicago, held Monday evening, November 13, at the LaSalle Hotel, Chicago.

Reconditioning Worn Car Journal Bearings

*By J. W. Lemon**



Basket of worn bearings as sent to lye vat for cleaning

Melting-out pot and table for removing babbitt from machine cuttings

Method of grinding car journal brasses on surface grinder

TO the average railway employee, worn car-journal bearings removed from equipment units represent scrap value, but to the trained mechanical employee they represent a great potential saving, and how to realize that saving by placing the bearings in condition at minimum cost for re-use is a problem that merits careful analysis and study.

The practice of relining bearings in company shops is not being generally followed, it being the practice on most railroads to ship their worn bearings to the foundry for scrap value and purchase new bearings. We have on the Missouri Pacific, however, demonstrated by actual practice that relining of our accumulation of worn journal bearings under scientific methods has effected considerable economy and has produced a bearing that is just as satisfactory for application as a new bearing. Of course, to carry on the reclaiming of worn car journal bearings, the necessary and proper equipment must be considered, and we have developed a modern, scientific method of operation, which may be summarized as follows:

Worn journal bearings, removed from equipment, are shipped in from outlying points to concentration point, where they are loaded into a basket of several tons' capacity and placed in a cleaning vat, where they are thoroughly cleaned. This basket of bearings is then placed on the washing platform, where the remaining residue is washed off, and the bearings are then classified by separating the different sizes, which are 4¼ in. by 8 in., 5½ in. by 10 in., and 6 in. by 11 in. Those bearings not suitable for relining are placed to one side to be disposed of as scrap, which amounts to between 25 and 30 per cent under the requirements of American Railway Association tolerance. When separating and classifying the different sizes of bearing shells, they are placed in lift-truck boxes and taken from the cleaning platform to the boring machine.

Removing Babbitt from the Shell

This machine has been developed especially to accommodate the operations necessary to bore the babbitt from these bearings, at the same time cleaning the shell. This machine is so designed that the bearings are placed on a turret table, which passes under the boring bar. The table is raised up and the straight end of the bearing is faced off. The machine is so operated that it next feeds by hydraulic pressure, boring out the babbitt metal, and at the same time boring out the bearing, the last operation being to face the fillet end. This rotation is continuous, as the table operates at such a speed that a bearing can be applied to the chuck while the boring operation is being done. The timing of this machine is such that it provides easy movement for handling and passing 100 bearings through it per hour.

Leaving the boring machine, the shells are taken to the surface grinder, where they are again passed through a classifying process, separating any further bearings which do not come under the tolerance gages, and then the flat surface of the bearing is ground off. This machine was also developed from an old vertical milling machine and is especially equipped for this particular operation. It is so timed and the application of the bearings to the table is such that a man can operate the

* Formerly superintendent of shops of the Missouri Pacific at Sedalia, Mo., and recently appointed mechanical superintendent of the Texas and Louisiana lines of this road, with headquarters at Houston, Tex.

machine and at the same time classify the bearings by the use of the tolerance gages and pass a bearing through the machine every 25 seconds. This machine is especially designed to grind the brasses all of equal thickness, this being necessary on account of bearings being accumulated from all foundries over the country, with a slight variation of sizes being encountered, which would seriously interfere with the bearings passing over the babbitt mandrels.

Leaving the grinding-machine table, the bearings are again placed in lift-truck boxes and are next taken to the tinning vat, which is especially designed and equipped with modern heat control. The bearings are placed in the soldering metal and thoroughly tinned with a solution of muriatic acid and sal ammoniac, this metal being heated by an oil burner, accurately controlled at from 675 to 700 deg. F., by a heat-control instrument.

After being thoroughly tinned under this predetermined temperature, the bearings are immediately passed to the mandrel table, where they are clamped with an air device, on the rotating table, and passed under the pouring spout of the babbitting furnace, the temperature of which is also controlled automatically at from 700 to 750 deg. F.

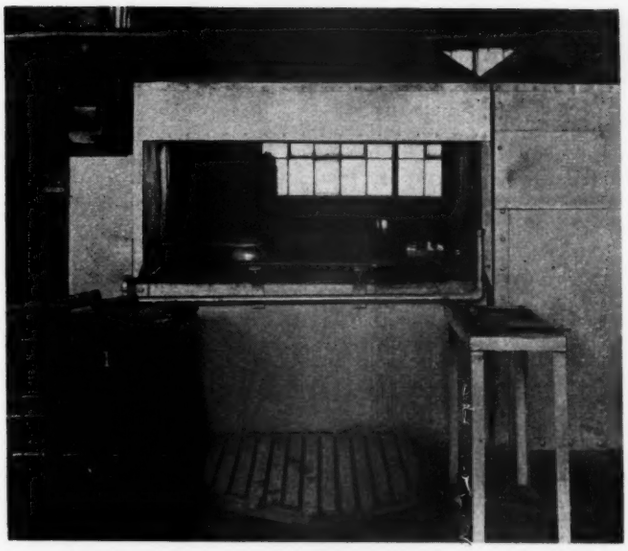
Proper Metal Proportions Important

One very important and scientific requirement in the handling of this important job is to know that the relined journal bearings have the proper specified metal applied, which should contain the following: Lead, 85.0 to 88 per cent; antimony, 8.0 to 10 per cent; tin, 3.0 to 5.0 per cent; arsenic, 0.2 per cent, max.; impurities, 0.5 per cent, max. In order to know that the bearings are being relined with this predetermined specification, a special agitating paddle has been applied to the babbitting furnace in order to keep the metal moving, as the heating is a refining process and if the metal is allowed to stand quietly, it will cause the lead, which is the heavier, to settle to the bottom, the antimony next and the tin, or lighter material, on top. With this method of agitating the metal, we have the assurance that all bearings relined under this method contain metal of the proper analysis.

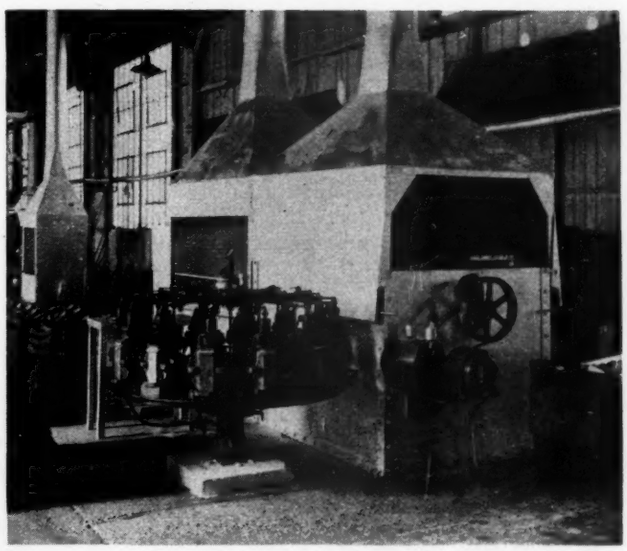
The proper tinning and the proper pouring at a predetermined temperature must be considered as an important part in the reclaiming of journal bearings, and this is carefully handled, due to the fact that the bearings are babbitted immediately after coming from the tinning furnace, and the babbitt applied while the bearing is still at the tinning temperature.

Leaving the babbitting mandrels, the bearings are placed in lift-truck boxes and are again sent to the boring machine for final boring. They pass through this specially designed machine at the rate of 100 bearings per hour.

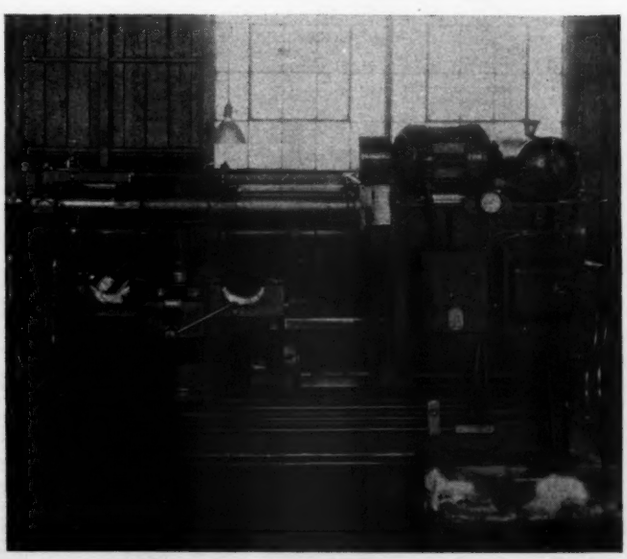
The babbitt bored from the original bearings, and that bored from the bearings after they come from the babbitting mandrels, is thrown from the machine into a lift-truck box and taken to the melting pot, where it is melted under the same conditions as in a babbitting furnace, with an agitating paddle to insure the babbitt being thoroughly mixed. It is then poured from the melting furnace into a rotating pigging form. This form passes, rotating, under the pouring spout of the melting furnace, and by tripping the table, the pigs of babbitt fall into a lift-truck box. Particular attention is paid to the selection of test samples from the pigs after they are run through the pigging furnace, and they are analyzed by a chemist, who determines the necessary additions to be made to this reclaimed metal in order to bring it back to the original specifications when it is again fed to the babbitting furnace.



A modern installation of vats is used to insure that the brasses are thoroughly tinned



The brasses are babbitted on an especially designed air-operated device with a rotating table



Boring machine for preliminary and final boring operations

Pertinent Questions on Hot Boxes

(*Continued from page 23*)

10—Do you employ men in terminal train yards for the sole purpose of servicing journal boxes?

11—Do you service journal boxes at freight houses as provided in A. R. A. Rule 66? If not, what are the objections?

12—What action are you taking toward complying with A. R. A. Rule 66, so far as stored cars are concerned?

13—Do you make special efforts toward servicing foreign cars in accordance with A. R. A. Rule 66, or is it confined to your company's cars?

14—Have you all the facilities required to properly comply with A. R. A. Rule 66?

15—What is your policy in connection with the use of seasonal oil?

16—What action is taken toward removing oil from service which has lost its film strength by overheating?

17—Do you deem the broaching of journal bearings desirable?

18—Do you know of any reason why the method of servicing journal boxes as outlined in A. R. A. Rule 66 is not entirely as it should be?

19—What method is used to ascertain whether or not journal boxes have been packed strictly in accordance with instructions?

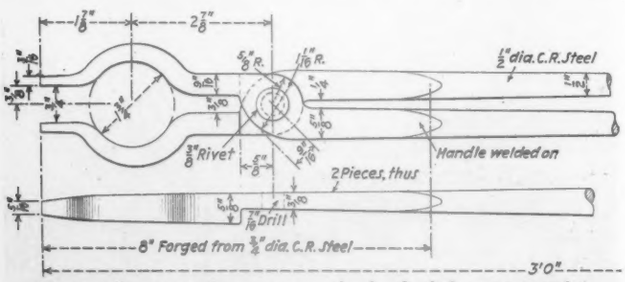
20—What is your general practices to keep packing in original position during cold weather?

21—What is your opinion regarding the time limits specified in A. R. A. Rule 66, for repacking journal boxes?

22—What method is used in determining train delay chargeable to a hot box?

Center-Pin Tongs

A PAIR of special tongs used for raising center pins into a clearance position when trucks are being removed from under freight cars is illustrated. The removal of the truck is thereby effected much more quickly, conveniently and safely than would be possible without



Tongs for entering center pin in freight-car trucks

the use of the tongs or some similar means of raising the center pins.

Referring to the drawing, the construction of the tongs is apparent, the jaws being so designed as to close on a 1¾-in. diameter pin with the open ends of the handles separated 5½ in. The tongs are made of ¾-in. cold rolled steel and the handles drawn out from ½-in. cold rolled steel.

Decisions of Arbitration Cases

(The Arbitration Committee of the A. R. A. Mechanical Division is called upon to render decisions on a large number of questions and controversies which are submitted from time to time. As these matters are of interest not only to railroad officers but also to car inspectors and others, the Railway Mechanical Engineer will print abstracts of decisions as rendered.)

Disputed Bill for Damage by Clam Shell

The Missouri Pacific rendered a bill to the St. Louis-Southwestern covering repairs to certain freight cars during the month of December, 1931, which was rejected because of the fact that items amounting to more than 10 per cent of the entire amount of the bill represented charges which the St. Louis-Southwestern claimed were for repairs from damage done by the McNulty Construction Company in unloading cars by means of clam-shell buckets. The Missouri Pacific disclaimed knowledge of damage by clam shell or other unloading machine and, therefore, denied responsibility for damage to the cars. The St. Louis-Southwestern, on the other hand, took the position that the Missouri Pacific did know that the cars were unloaded in that manner and that the responsibility for the damage rested with the latter road under Rule 32, interpretation 6. The St. Louis-Southwestern contended that the rule and interpretation applied in this case for the reason that the cars involved did not leave the switching district of Pine Bluff and that it was a known fact that these cars were being unloaded by clam shell by the McNulty Construction Company on Missouri Pacific rails, which, it was contended, was sufficient evidence definitely to determine the responsibility of the Missouri Pacific for the damage. It further contended that it is not the intention that handling line employees must actually see each part damaged to establish responsibility for the damage. The Missouri Pacific stated that the cars were delivered to the owners at Pine Bluff and the owners' inspector took exception to certain damage and requested defect cards covering damage by clam shell. The Missouri Pacific inspector, having no knowledge as to where the damage occurred, asked the St. Louis-Southwestern to accept the cars pending investigation as to responsibility. The action of the St. Louis-Southwestern in refusing to accept their own cars, pending investigation, made it necessary for the Missouri Pacific to remove the cars to Little Rock shop for repairs to make the cars acceptable to the owners and to avoid excessive per diem payments. A thorough investigation was conducted to determine how and where the cars were damaged and, according to the statement of the Missouri Pacific, investigation plainly showed that the damage repaired by their forces was not the result of the operation of clam shell or unloading machines.

In a decision rendered November 4, 1932, the Arbitration Committee said that: "The Missouri Pacific makes positive statement that its investigation failed to substantiate the car owners' claim that the damage was caused by clam shell while the cars were in the possession of the Missouri Pacific. No conclusive evidence is presented to offset this statement. Therefore, the contention of the car owner is not sustained."—*Case No. 1720, St. Louis-Southwestern vs. Missouri Pacific.*

In the Back Shop and Enginehouse

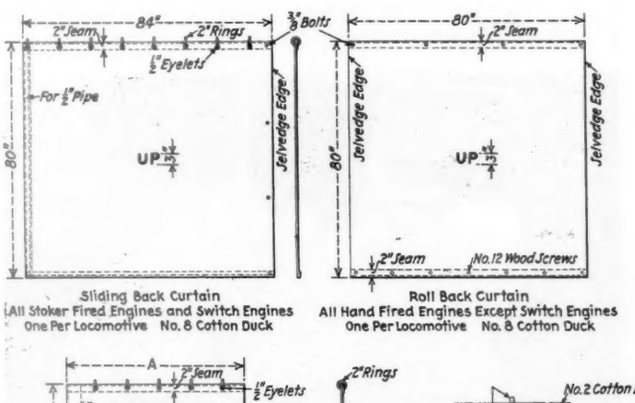
Making Cab Curtains

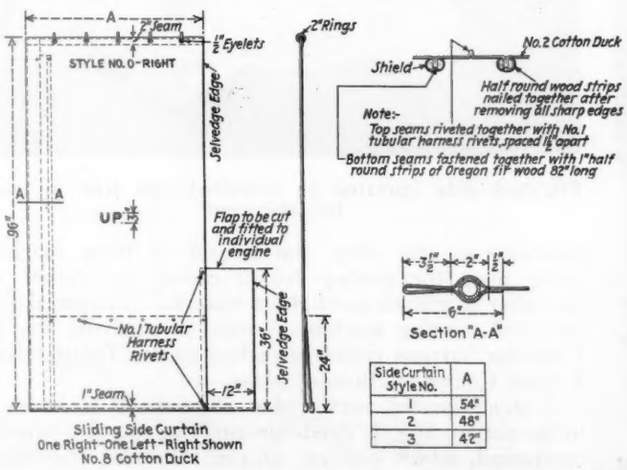
THE question of making locomotive cab curtains for railroads operating in the northern part of the country, and particularly those having substantial numbers of locomotives in operation, is especially important because these curtains must not only provide adequate protection for engine crews, but be designed with these requirements. The actual work of making the curtains is usually performed in the car-department upholstery shop and the magnitude of the job is indicated by the fact that on the Union Pacific, for example, the first order for cab curtains in the fall of 1933 was for a total of 1,800, to be made on store orders in lots of 200 at a time. This work is usually started in August and finished by October, in order that, so far as practicable, all locomotives in service can be equipped before the advent of real cold weather.

A brief outline of how this work is handled on the Union Pacific may be of general interest. The cab curtains used on this locomotive have been standardized in three styles for all classes of locomotives. The hood curtain, made of No. 2 cotton duck, is 88 in. wide by 58 in. or 42 in. long, dependent upon the class of locomotive, being provided with an 18-in. overhang on the tender end and on each side. An inside flap on each is also arranged to fit over the upper end of the side curtains. The hood curtains are stiffened with 1-in. half-round wood strips, either 7 or 11 per curtain, depending upon the length, and have top seams riveted to-

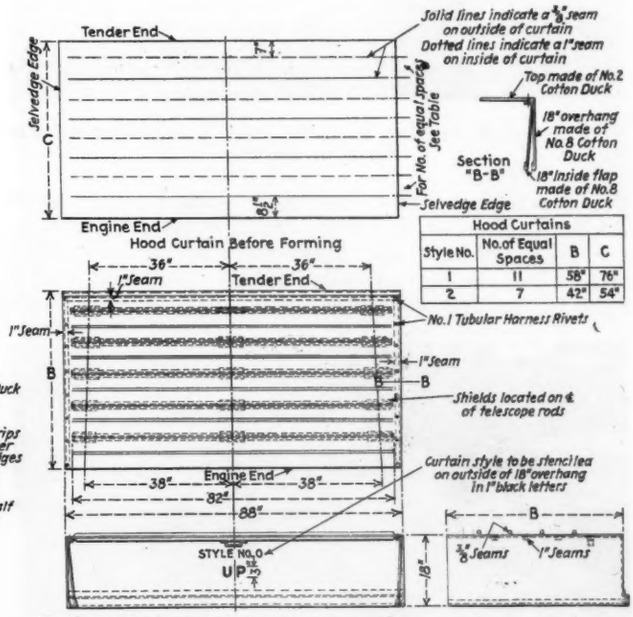
Lay-out table and operation of cutting locomotive and cab curtain material

gether with tubular harness rivets spaced 1½ in. apart. The half-round strips are made of Oregon fir, 82 in. long. The seams are ⅜ in. wide. The overhang is





Side Curtain Style No.	A
1	54"
2	48"
3	42"


Solid lines indicate a ⅜" seam on outside of curtain
Dotted lines indicate a 1" seam on inside of curtain
Tender End
Selvedge Edge
C
For No. of equal spaces See Table
Top made of No.2 Cotton Duck
18" overhang made of No.8 Cotton Duck
Section "B-B"
18" Inside flap made of No.8 Cotton Duck
Engine End
Hood Curtain Before Forming
36"
1" Seam
No.1 Tubular Harness Rivets
B
Shields located on ¢ of telescope rods
Curtain style to be stenciled on outside of 18" overhang in 1" black letters
38"
82"
88"
STYLE No.0
⅜" Seams
1" Seams
18"
Hood Curtain After Forming One Per Locomotive

Hood Curtains			
Style No.	No. of Equal Spaces	B	C
1	11	58"	76"
2	7	42"	54"

Size of Canvas to be Ordered for the Manufacture of Cab Curtains		
Type of Curtain	Width of Roll	Material
Top of Hood Curtain	88"	No.2
Sliding Back Curtain	86"	8
Roll Back Curtain	80"	8
Side Curtain-Style-1	60"	8
Side Curtain-Style-2	54"	8
Side Curtain-Style-3	48"	8

Details of Union Pacific standard cab curtains

Close-up view showing the method of using the Eastman electric goods cutter

made of No. 8 cotton duck and the inside flaps are also of the same material.

The sliding side curtains are all 96 in. high, but made in three widths, 54 in., 48 in., and 42 in., dependent upon

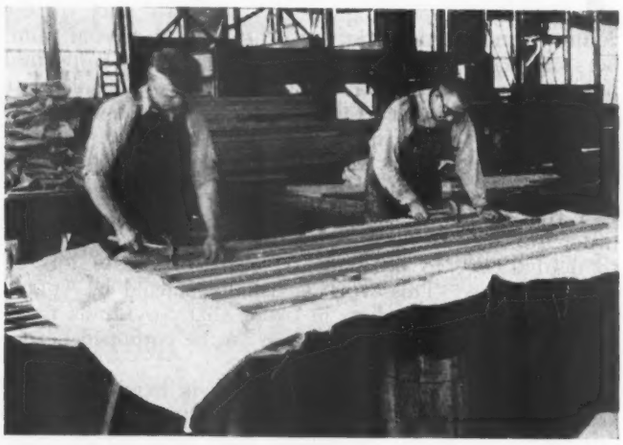
Foot-operated riveting machine used in applying tubular harness rivets

the class of locomotive, the material being No. 8 cotton duck. The top of each side curtain is fitted with ½-in. eyelets and 2-in. rings, which slide on the supporting rod. One side of each side curtain is stiffened with a light 1¼-in. tube, the other selvage being provided with

Curtains after being treated with fire-proofing compound and thoroughly dried

a flap, 36 in. high, to be cut and fitted to the individual locomotive. In general, the back curtains are divided into two types, either the sliding back or the roll back design, the first being used on all stoker-fired locomotives and switch engines, and the latter on all hand-fired locomotives, except switching locomotives. The back curtain, made of No. 8 cotton duck, is 80 in. high, in each case, by 84 in. wide, for the sliding-back type, and 80 in. wide for the roll-back type. Eyelets and 2-in. rings are applied at the top of the sliding-type curtain and a round wood strip, inserted in a 2-in. seam and held by 7 wood screws, in the bottom of the roll-type curtain.

Equipment used at the Omaha (Neb.) shops of the U. P. for manufacturing these curtains is shown in the



Method of applying one-half round 1-in. wood strips to hood curtains

illustration and comprises an electric goods cutter, made by the Eastman Machine Company, Buffalo, N. Y. This machine operates on 110 volts, 60 cycles and 5 amperes, and is designed to cut 50 thicknesses of No. 8 canvas at a time. Five motor-driven Singer sewing machines are

Finished side curtains as stenciled and tied up ready for shipment

provided in this shop, the largest of these machines being used for sewing No. 2 canvas or leather and the other machines for lighter material. A special foot-operated riveting machine is used in applying the No. 1 tubular harness rivets furnished by the Tubular Rivet & Stud Company, Boston, Mass.

A steam-heated, rectangular, sheet-metal tank, set up in an outbuilding, is used for applying the fire-proofing compound, which consists of the following ingredients in 200 gal. of water: 64 lb. of ammonium sulphate, 20

lb. of ammonium carbonate, 24 lb. of boric acid, 14 lb. of borax and 16 lb. of starch. This is adequate to fireproof 50 canopy hoods, the application consisting of soaking the curtains in a boiling vat for one-half hour and then removing the curtains and allowing them to drain and dry.

The detailed operations in making 50 canopy hoods and the time required is as follows:

Cut 50 hoods	1	hr.
Cut 50 short flaps	2½	hr.
Cut 50 long flaps and stencil	4	hr.
Cut 50 six-inch strips for wood strips	1	hr.
Mark 50 hoods for riveting and folding	5	hr.
Hem 50 short flaps	2	hr.
Sew 50 six-inch strips to long flaps	9	hr.
Rivet 50 canopy hoods	37½	hr.
Sew 50 long and short flaps to hoods	8	hr.
Fire-proof 50 canopy hoods	16	hr.
Apply 600 wood strips to 50 hoods	20	hr.
Total	106	hr.

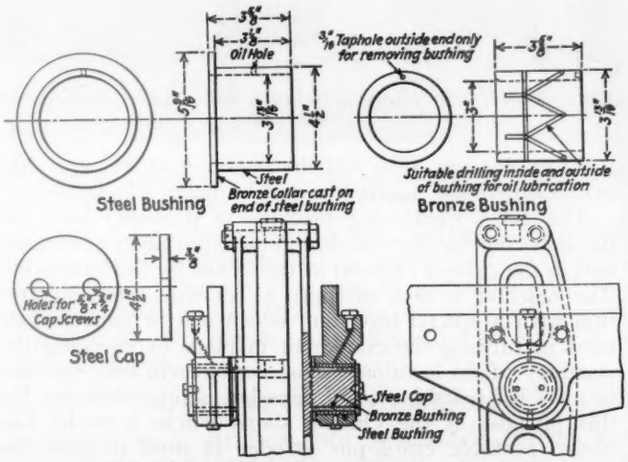
The method of making side and back curtains is much simpler than for hood curtains and consists simply of cutting cotton duck of the specified weight into the correct sizes and hemming the edges, where necessary, for the application of stiffening rods or rolls. The eyelets for sliding curtains are applied, using a hand punch and block with 2-in. rings inserted through the eyelets. All curtains are stencilled with the name of the railroad and the size and type of curtain.

Locomotive Cab Curtains Used, Manufactured, To Be Manufactured and Anticipated Issues for Year 1933

Description	Used up to Sept. 21, 1933	Made up to Sept. 21, 1933	Estimate to be made, balance year 1933	Anticipated issues balance year 1933
Roll back, 80 in. by 80 in.	92	110	50	90
Sliding back, 80 in. by 84 in.	227	350	100	250
Sliding side style, 1 right, 54 in.	127	95	300	300
Sliding side style, 1 left, 54 in.	105	67	300	300
Sliding side style, 2 right, 48 in.	74	70	25	49
Sliding side style, 2 left, 48 in.	77	70	25	44
Sliding side style, 3 right, 42 in.	17	15	65	76
Sliding side style, 3 left, 42 in.	22	10	65	79
Hood style, 1, 58 in.	110	110	200	200
Hood style, 2, 42 in.	86	84	50	50

Floating Bushings in Link Trunnions

THE accompanying drawings show the application of a type of floating bushing to the trunnions of a Walschaert link which was developed at the Baltimore shop of the Maryland and Pennsylvania in an effort to eliminate the excessive labor necessary in the replacement of link trunnion bushings on heavy power.


Oil Hole
3/16" Taphole outside end only for removing bushing
Steel Bushing
Steel Bronze Collar cast on end of steel bushing
Suitable drilling inside and outside of bushing for oil lubrication
Bronze Bushing
Holes for 5/8" x 3/4" Cap Screws
Steel Cap
Steel Cap
Bronze Bushing
Steel Bushing

Details of floating link trunnion bushing

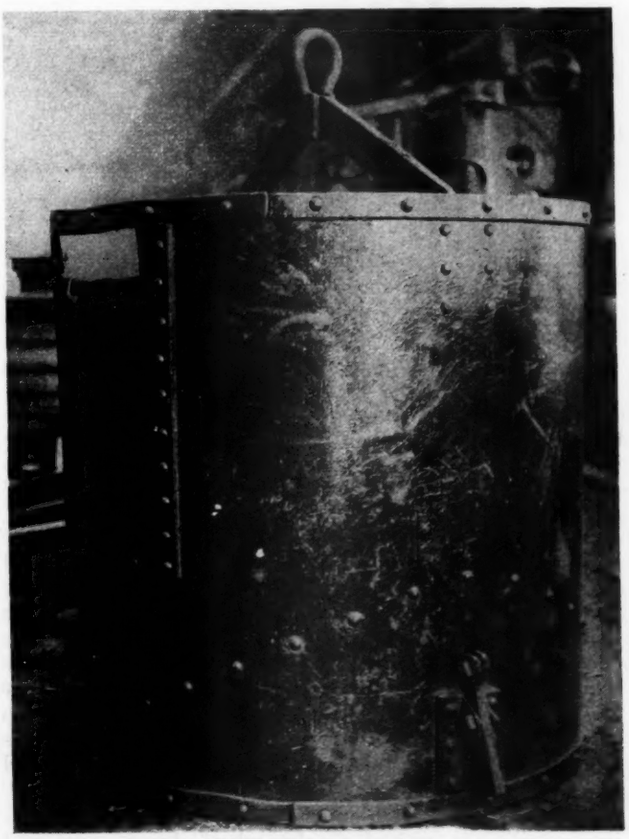
The arrangement consists of a steel bushing pulled tightly into the link support frame and securely anchored. This bushing has a manganese bronze lateral collar on the inside of the frame; the collar being built up on the rough bushing by means of oxy-acetylene welding. A floating bronze bushing which is drilled and grooved for lubrication and a steel collar with cap screws and lock washers complete the assembly.

A few bushings are carried in stock and, with very little labor, the heaviest trunnion bushing, either inside or outside can be renewed in about 15 min.

Experience with this arrangement in service has developed the fact that the life of bushings is greatly increased as a result of the equalization of the wear instead of an accumulation of wear in one direction.

Boring Container For the Wheel Shop

THE container shown in the accompanying photograph is used in the wheel shop of an eastern railroad for handling borings from the wheel lathe to the scrap car. A pit is provided under the lathe and the borings or turnings fall into a trough that empties into the container. After the container is loaded it is raised from the pit by a crane and taken to the scrap car.



Borings from the wheel shop are carried to scrap bins in this container

On the right side of the container a "trip" is located which, when engaged on the top angle of the scrap car releases the bottom of the container and permits the con-

tents to fall through. When the container is replaced into the pit at the lathe the bottom automatically closes as it comes in contact with the pit floor.

The container is 48 in. in diameter and is five feet high. It is provided with a drop door on one side in order that it can be used for other purposes around the shop where dirt or other materials can be shoveled into it.

Driving-Wheel Repairs

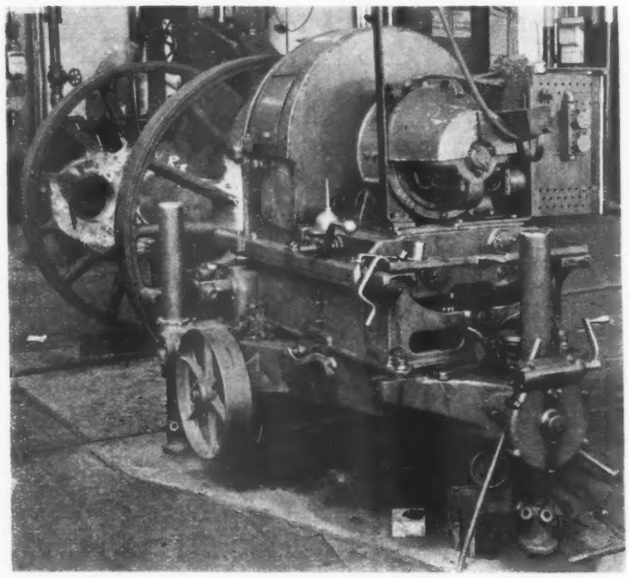
IN view of the great weights carried on modern locomotive driving wheels and the large amounts of power transmitted through them, they constitute a highly important locomotive detail which must receive the most skillful and conscientious attention in all repair operations. The Union Pacific has made a particular study of driving-wheel maintenance work, and the wheel shop at Omaha, Neb., for example, is organized and equipped to give the driving wheels of locomotives received for repairs

A pair of driving wheels being checked for quarter and stroke in the Niles quartering machine

the kind of attention which is essential for the best results.

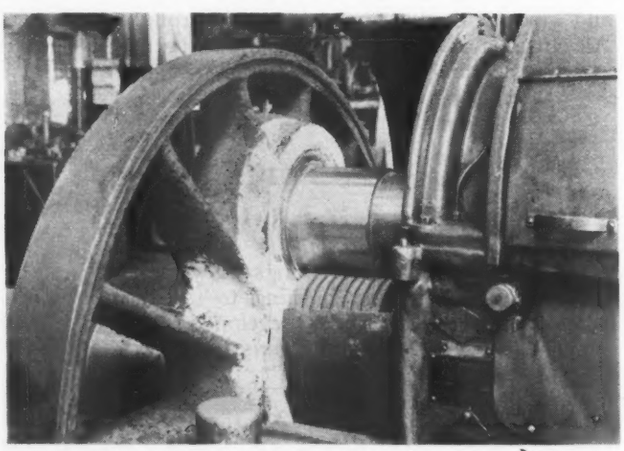
The following general procedure is carried out in reconditioning driving wheels. A competent inspector first inspects the tires of locomotives received at the shop for repairs and, if doubtful, the tires are calipered and checked with an A. R. A. gage to determine if they are thick enough to be turned and still remain above the shop limit of thickness. In case the tires are thin, a new set is ordered so as to avoid any delay in handling the wheels in the shop. In accordance with the more or less general practice, if one tire of a set has a sharp flange, a second-hand tire of the proper thickness is substituted in order to save turning down service metal on the entire set.

After a locomotive is unwheeled in the shop, the driving wheels are moved to the wheel department, and thoroughly cleaned with kerosene, particular attention being paid to the journals, hubs and crank pins. A coating of alcohol and whiting is then applied on these parts and, when dry, a thorough inspection is made to detect any cracks. These are usually found around the keyways, inside of the hubs and between the axle and pin fits. All pins and journals are calipered and any below the shop limit or age limit are dismounted and renewed. In case a new axle is applied to a pair of wheels, both crank pins are accurately checked, machined and ground in order to make sure they are in the correct stroke and quarter, and that this pair of wheels when turned out of the shop will be in condition to give a full term of service without further repairs. In every case, the



Micro portable crank-pin grinding machine set up ready for operation

driving wheels are put in the quartering machine and the pins checked for stroke and quarter, even when they are not removed. Crank pins have been found by this method of checking to be out of position as much as

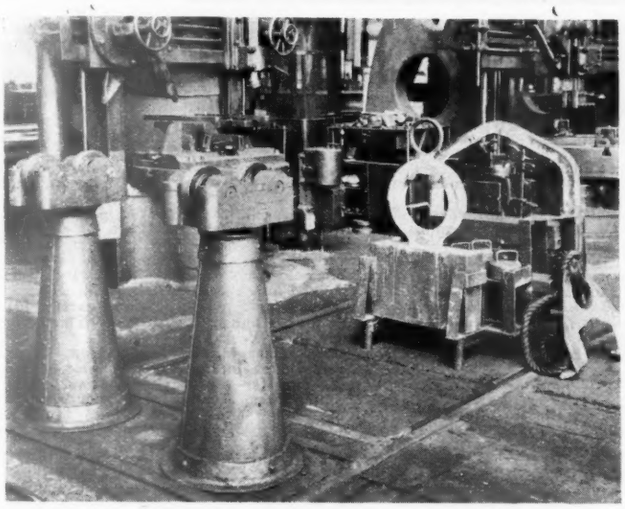


Close-up view of abrasive wheels and a partially-finished crank pin

3/32 in. or even 3/16 and the resultant effects upon the operation of the locomotive can be readily imagined.

The Niles quartering machine is provided with the usual boring bar for finishing crank-pin holes accurately and in the correct location as called for by the blue-print. The machine is also equipped as shown in the illustration with a special box tool, which can be conveniently used in turning the crank pin in place or checking the accuracy of its location. This double-arm tool can also be used for polishing crank pins but is not employed for this purpose at the Omaha shops where a model GG Micro portable crank-pin grinder is used to give the required finish on crank pins. After crank pins are

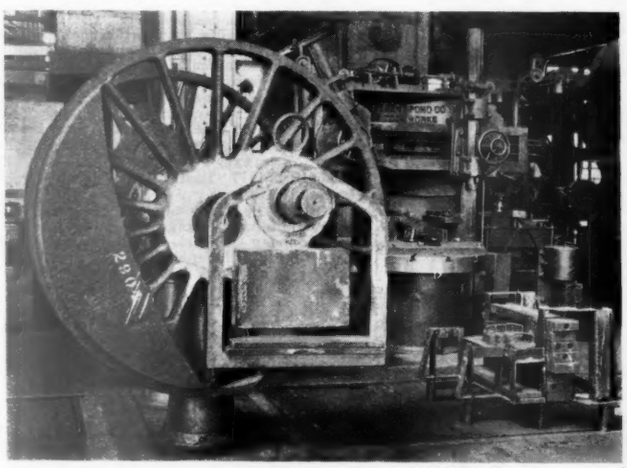
trued in the quartering machine, the driving wheels are taken to the crank-pin grinding machine which is driven by a Fairbanks-Morse 7½-hp. direct-current motor and develops a grinding-spindle speed of 2,400 r.p.m., using grinding wheels 9 in. in diameter, when new. The abrasive wheels not only revolves at high speeds for the grinding operation, but move in a circumference around the crank pin, also having a slow and automatic oscillating



Equipment used in checking locomotive driving-wheel counterbalance at Omaha shops

motion parallel with the axis of the pin, to assure a uniformly smooth and accurate pin diameter. The grinding wheels are kept true and in good cutting condition by the use of a self-contained diamond-truing device provided for in the machine design.

In this grinding operation, both the grinding machine and the driving wheels are supported on a firm foundation and the machine properly located with respect to the wheels and crank pin by means of the supporting jack screws. The machine is then clamped solidly to



A pair of wheels resting on the roller-bearing stands and with weights applied to the crank pin

the wheel, being held square by a bearing against the wheel center, and the grinding operation is carried to completion. The operation, including the set-up time, depends upon the condition of the pin, but usually takes not over 30 min. for an ordinary pin, or 45 min. for a main crank pin.

Method of Counterbalancing

In addition to the great care exercised in assuring the proper axle and crank-pin conditions on Union Pacific locomotive driving wheels, the counter-balance weights are carefully checked on every locomotive going through the shop for general repairs to make sure that they are correct. The equipment, shown in two of the illustrations and used for this purpose, consists of two cone-shape sheet-metal stands, supported on a solid concrete foundation and carrying on the top casting of each a pair of rolls supported on Timken roller bearings, which have been carefully levelled and are designed to bear against the driving wheel journals, permitting the wheels to turn freely. Two types of steel weighted yokes, with roller-bearing supports on the main crank pin, are shown in the illustration. The inner and heaviest yoke is provided with a fixed known weight, as illustrated. The outer yoke, which bears on the outer portion of the crank pin, is designed to carry special bars of different weights, as indicated, with brass tags applied to show the weight of each. With the use of this equipment, an accurate determination can be made of the amount of additional or reduced weight necessary in the counterbalance to make it comply with the blue-print requirements.

Combination Die Head

A COMBINATION die head, hardened and ground throughout, that will take either circular or tangent chasers interchangeably has recently been placed on the market by the Geometric Tool Company, New Haven, Conn., to supplement its present line of die heads. In these die heads the chasers, together with the holders, may be extracted from the head, ground and set and replaced without removing the head from the machine. The chasers may also be removed from the holders and accurately ground in a Geometric fixture which is adapted for use on any universal surface grinding machine. The circular chaser has a series of serrations for coarse adjustment, but any desired degree of adjustment between serrations may also be obtained. The tangent chasers are also provided with equally minute adjustment. In resharpening only metal need be ground off either type of chaser to leave a clean cutting edge. The chaser holder support is made rigid by heavy T-slots and broad reinforcing wings, as well as a post support for the circular chaser which is integral with the holder. The front plates that help form the T-slots which support the chaser holders are removable and replaceable in case of wear. Locking surfaces which hold the chasers in cutting position, a means for positive tripping and adjusting and provision for disassembling the head for cleaning are features of the former design of Geometric die heads that have been retained in these new models. The combination principle (either tangent or circular chasers in one tool) is available in die heads both of the rotary and stationary types, with the helix either in the chaser or in the holder.

WHEN CHICAGO'S CENTURY OF PROGRESS Exposition closed its gates, Fred Metcalf of East Grand Forks, Minn., and G. A. Kingsley of Portland, Ore., both retired engineers on the Northern Pacific, concluded six months of pretty slow going in the cab of a locomotive. These two engineers had charge of the Minnetonka, the first locomotive ever purchased by the Northern Pacific, which was a feature of the show known as "Wings of a Century" at the Fair. Although the Minnetonka was in service every day of the Fair, with the exception of three days when rain prevented the show, it is estimated that it actually traveled only 174 miles during the entire six months.

Among the Clubs and Associations

THE AMERICAN SOCIETY FOR TESTING MATERIALS has moved its headquarters from the Engineers' Club building, 1315 Spruce street, Philadelphia, Pa., to the Atlantic building, 260 South Broad street in the same city.

WESTERN SOCIETY OF ENGINEERS.—High-speed transportation was the subject of discussion at a meeting of the Railroad section of the Western Society of Engineers at Chicago on December 18, A. Cotsworth, Jr., passenger traffic manager, and O. E. Ward, superintendent of motive power of the Chicago, Burlington & Quincy, being the speakers. The changing aspect of passenger traffic, according to Mr. Cotsworth, has necessitated the development of high-speed trains which can be operated at low cost and thus enable the carriers to meet the demands for cheaper transportation. He said that because high-speed trains are designed to accelerate and stop within short distances, they are adapted especially to local business. Mr. Ward described the mechanical features of the train being built by the Burlington and outlined the problems confronted in the development of high-speed trains. He said the designing of a satisfactory braking mechanism for these trains requires special study because of the speed and the light weight of the cars.

Directory

The following list gives names of Secretaries, dates of next regular meetings and places of meeting of mechanical associations and railroad clubs:

AIR-BRAKE ASSOCIATION.—T. L. Burton, Room 2205, 150 Broadway, New York.

ALLIED RAILWAY SUPPLY ASSOCIATION.—F. W. Venton, Crane Company, Chicago.

AMERICAN RAILWAY ASSOCIATION.—Division V.—MECHANICAL.—V. R. Hawthorn, 59 East Van Buren street, Chicago.

DIVISION V.—EQUIPMENT PAINTING SECTION.—V. R. Hawthorn, Chicago.

DIVISION VI.—PURCHASE AND STORES.—W. J. Farrell, 30 Vesey street, New York.

DIVISION I.—SAFETY SECTION.—J. C. Caviston, 30 Vesey street, New York.

DIVISION VIII.—CAR SERVICE DIVISION.—C. A. Buch, Seventeenth and H streets, Washington, D. C.

AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—G. G. Macina, 11402 Columet avenue, Chicago.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. Thirty-ninth street, New York.

RAILROAD DIVISION.—Marion B. Richardson, Room 332, 30 Church street, New York.

MACHINE SHOP PRACTICE DIVISION.—R. E. W. Harrison, 6373 Beechmont avenue, Mt. Washington, Cincinnati, Ohio.

MATERIALS HANDLING DIVISION.—M. W. Potts, Alvey-Ferguson Company, 1440 Broadway, New York.

OIL AND GAS POWER DIVISION.—Edgar J. Kates, 1350 Broadway, New York.

FUELS DIVISION.—W. G. Christy, Department of Health Regulation, Court House, Jersey City, N. J.

CANADIAN RAILWAY CLUB.—C. R. Crook, 2276 Wilson avenue, Montreal, Que. Regular meetings, second Monday of each month except in June, July and August at Windsor Hotel, Montreal, Que.

CAR DEPARTMENT OFFICERS ASSOCIATION.—A. S. Sternberg, master car builder, Belt Railway of Chicago.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—G. K. Oliver, 2514 West Fifty-fifth street, Chicago. Regular meetings, second Monday in each month except June, July and August, La Salle Hotel, Chicago, Ill.

CAR FOREMEN'S ASSOCIATION OF OMAHA, Council Bluffs and South Omaha Interchange.—Geo. Kriegler, car foreman, Chicago, Burlington & Quincy, Sixteenth avenue and Sixth street, Council Bluffs, Iowa. Regular meetings, second Tuesday of each month at Council Bluffs.

CENTRAL RAILWAY CLUB OF BUFFALO.—M. D. Reed, Room 1817, Hotel Statler, Buffalo, N. Y. Regular meeting, second Thursday each month except June, July and August, at Hotel Statler, Buffalo.

CLEVELAND RAILWAY CLUB.—F. B. Frericks, 14416 Alder avenue, Cleveland, Ohio. Meeting second Monday each month, except June, July and August, at the Auditorium Hotel, East Sixth and St. Clair avenue, Cleveland.

EASTERN CAR FOREMEN'S ASSOCIATION.—E. L. Brown, care of the Baltimore & Ohio, Staten Island, N. Y. Regular meetings, fourth Friday of each month, except June, July, August and September.

INDIANAPOLIS CAR INSPECTION ASSOCIATION.—R. A. Singleton, 822 Big Four building, Indianapolis, Ind. Regular meetings first Monday of each month, except July, August and September, at Hotel Severin, Indianapolis, at 7 p. m. Noon-day luncheon, 12:15 p. m. for Executive Committee and men interested in the car department.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—T. D. Smith, 1660 Old Colony building, Chicago.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—William Hall, 1061 W. Wabasha street, Winona, Minn.

INTERNATIONAL RAILROAD MASTER BLACKSMITH'S ASSOCIATION.—W. J. Mayer, Michigan Central, 2347 Clark avenue, Detroit, Mich.

MASTER BOILERMAKERS' ASSOCIATION.—A. F. Stiglmeier, secretary, 29 Parkwood street, Albany, N. Y.

NEW ENGLAND RAILROAD CLUB.—W. E. Cade, Jr., 683 Atlantic avenue, Boston, Mass. Regular meeting, second Tuesday in each month, excepting June, July, August and September.

NEW YORK RAILROAD CLUB.—D. W. Pye, Room 527, 30 Church street, New York. Meetings, third Friday in each month, except June, July and August, at 29 West Thirty-ninth street, New York.

NORTHWEST CAR MEN'S ASSOCIATION.—E. N. Myers, chief interchange inspector, Minnesota Transfer Railway, St. Paul, Minn. Meeting first Monday each month, except June, July and August, at Minnesota Transfer Y. M. C. A. Gymnasium building, St. Paul.

PACIFIC RAILWAY CLUB.—William S. Wollner, P. O. Box 3275, San Francisco, Cal. Regular meetings, second Thursday of each month in San Francisco and Oakland, Cal., alternately.

RAILWAY CAR MEN'S CLUB OF PEORIA AND PEKIN.—C. L. Roberts, R. F. D. 5, Peoria, Ill.

RAILWAY CLUB OF PITTSBURGH.—J. D. Conway, 1941 Oliver building, Pittsburgh, Pa. Regular meeting fourth Thursday in month, except June, July and August, Ft. Pitt Hotel, Pittsburgh, Pa.

RAILWAY FIRE PROTECTION ASSOCIATION.—R. R. Hackett, Baltimore & Ohio, Baltimore, Md. Annual meeting October 17-18, Hotel Stevens, Chicago.

RAILWAY SUPPLY MANUFACTURERS' ASSOCIATION.—J. D. Conway, 1841 Oliver buiding, Pittsburgh, Pa. Meets with Mechanical Division and Purchases and Stores Division, American Railway Association.

SOUTHERN AND SOUTHWESTERN RAILWAY CLUB.—A. T. Miller, P. O. Box 1205, Atlanta, Ga. Regular meetings third Thursday in January, March, May, July, September and November. Annual meeting, third Thursday in November, Ansley Hotel, Atlanta, Ga.

SUPPLY MEN'S ASSOCIATION.—E. H. Hancock, treasurer, Louisville Varnish Company, Louisville, Ky. Meets with Equipment Painting Section, Mechanical Division American Railway Association.

TORONTO RAILWAY CLUB.—N. A. Walford, district supervisor car service, Canadian National, Toronto, Ont. Meetings first Friday of each month except June, July and August.

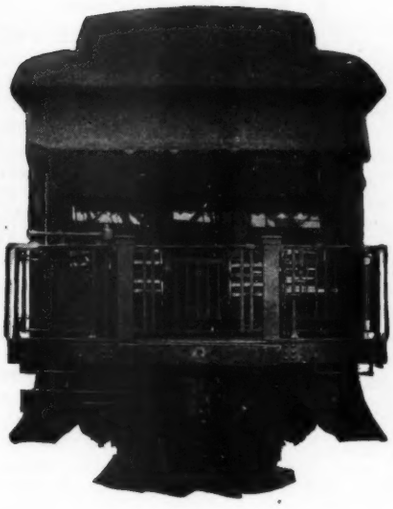
TRAVELING ENGINEER'S ASSOCIATION.—W. O. Thompson, 1177 East Ninety-eighth street, Cleveland, Ohio.

WESTERN RAILWAY CLUB.—C. L. Emerson, 822 Straus Building, Chicago. Regular meetings third Monday in each month except June, July, August and September.

* * *

The Francis N. Root—No. 2 of the Coudersport & Port Alleghany Railroad—Built in 1882—Cylinders, 12 in. by 16 in.; driving wheels, 43 in. diameter

NEWS



THE AMERICAN TANK LINE has accepted delivery of 10 tank cars of 40 tons' capacity. These cars were ordered from the American Car & Foundry Company.

THE PENNSYLVANIA SALT MANUFACTURING COMPANY has ordered two tank cars of 40 tons' capacity from the American Car & Foundry Company.

THE CHICAGO, MILWAUKEE, ST. PAUL & PACIFIC is inquiring for 50 coaches and will shortly inquire for 25 baggage cars.

THE NATIONAL RAILWAYS OF MEXICO has placed an order with the Locomotive Firebox Company for nine sets of syphons to be applied to existing Consolidated, Pacific and Mikado-type locomotives.

THE ESCANABA & LAKE SUPERIOR has purchased from Fairbanks Morse and Company a pneumatic-tired rail bus for use in transporting mail and passengers over its line. The bus, which was built to E. & L. S. specifications, consists of a Dodge chassis, equipped with Goodyear Tire & Rubber Company pneumatic rail tires.

Burlington High-Speed Train To Be Ready in March

THE THREE-CAR articulated, high-speed train being built by the E. G. Budd Manufacturing Company for the Chicago, Burlington & Quincy will be delivered to the railroad in Chicago during March, after a three weeks' tour of the East. While the itinerary of the train has not been definitely decided upon, approximately 24 eastern points and 80 western points will be visited before the train is placed in regular service.

Eastman Gives Results of Special Inspection of Stored Equipment

CO-ORDINATOR EASTMAN on January 4 announced the results of the special inspection of cars and locomotives, reported stored in serviceable condition October 1, made at his request by I. C. C. bureaus saying that facts developed lead to the conclusion that neither fears of a freight car shortage nor the optimism of those who relied upon railroad reports of surplus equipment were fully justified. Of freight cars inspected 55.5 per cent were found fit for the service for which they were designed, 4.4 per cent unfit for any service until repaired and 40.1 per cent were suitable for the transportation of certain commodities only. Of locomotives inspected 21.3 per cent were in need of repairs requiring three days or more.

Railway Car Building Industry Code Hearing

TOTAL SALES of the railway car building industry during the first half of this year were but slightly more than 3 per cent of an estimated capital investment of $270,000,000, proponents of a code of fair competition for that industry told the National Recovery Administration at the public hearing conducted before Assistant Deputy Administrator F. H. Kuhn, at Washington on December 27.

C. A. Liddle, president of the Pullman Car & Manufacturing Corporation, formally presented the code and stated that it had received written approval of each of the 20 members of the American Railway Car Institute, representing 96 per cent of the industry's volume of sales. After pointing out that total business had dropped from a value of $258,926,973 in 1929 to $7,523,000 in the first six months of 1933, with a consequent decrease in employment from 34,243 persons to 5,920 workers, Mr. Liddle asserted that it was "extremely doubtful" whether the slight interest now observable in new purchases of the industry's products would continue if production costs were increased beyond the point proposed in the code.

Speaking of labor provisions of the code, F. A. Stevenson, also representing the institute, declared that the proposed 40-hour maximum week would operate to increase employment 20 per cent. He stated that the previous "customary" workweek ranged from 50 to 55 hours, and cited this fact in support of the request for a 48-hour maximum week during any 12 weeks in a year to take care of "spasmodic" peak periods.

Objections were made as to what were characterized as "qualifications" of the proposed basic minimum wage of 40 cents per hour; the proposal to have all bids deposited in advance with the code authority and to the provision which would limit productive capacity of the industry; the method for depositing bids with the code authority, and the inclusion of an actual cost formula in the code.

After announcing that the code committee would meet with various representatives of the N.R.A. in a series of conferences to develop a generally satisfactory code for presentation to the President, the hearing was indefinitely recessed.

Use of Air-Conditioned Equipment Extended

ALL THROUGH passenger trains on the Pennsylvania will be air-conditioned next summer according to an announcement made recently by D. M. Sheaffer, chief of passenger transportation. Last summer for the first time all of the hourly trains between New York and Philadelphia on the Pennsylvania, as well as its through trains between New York, Philadelphia and Washington, carried air-conditioned coaches, dining cars and parlor cars. Their use will be extended to the main-line service for all through trains between the principal cities of the East and West. The Pennsylvania at the present time, the announcement says, has in operation the largest fleet of air-conditioned trains of any railroad in the world. The additional coaches, diners, and Pullman parlor and sleeping cars which will be placed in service between now and next May in its through East and West trains will raise the total number of air-conditioned cars to almost 700.

An order has been placed with the Frigidaire Corporation, amounting to $500,000 for the material necessary to air-condition these coaches and dining cars on these trains. The equipment, consisting of coils, condensers, etc., will be turned over to the Pennsylvania as soon as it is ready, and the installation will be made in the Altoona shops of the railroad.

The New York Central plans a complete air-conditioning of the Twentieth Century Limited and also will air-condition cars in its principal trains between the chief commercial centers which they serve. Sleeping cars, dining cars, club cars and some coaches will be equipped. Dining cars on the Century already are air-conditioned. The work of installing the new equipment is expected to be completed and the cars ready for service next summer. Since July, 1932, this road has air-cooled cars on its principal trains serving not only New York and Chicago, but in the other leading cities on its lines. The Central now owns about 200 units of air-cooling equipment which will be retained to cool cars on trains that do not have the new air-conditioning apparatus.

P. W. A. Negotiations

As the negotiations and "paper work" incident to the making of loans to railroads by the Public Works Administration gradually progress it becomes apparent that a very considerable volume of employment and business is to result from the willingness of many roads to anticipate future requirements and the willingness of the government to finance them on as reasonable terms as the law will permit. Allotments for railroad loans, to be used for the purchase of new equipment, rails, fastenings, etc., the improvement of roadway, bridges, etc., or the repair or modernization of existing equipment and facilities, now total approximately $200,000,000. Applications for loans from the P. W. A., or allotments have already been made as follows:

	Applied for	Allotted
Baltimore & Ohio	.....	$4,230,000
Boston & Maine	.....	5,500,000
Central of Georgia	.....	500,000
Chesapeake & Ohio	.....	18,290,000
Chicago & Eastern Illinois	$251,300	.....
Chicago & North Western	3,500,000	1,400,000
Chicago, Milwaukee, St. Paul & Pacific	1,818,750	.....
Erie	.....	11,964,000
Illinois Central	10,000,000	9,300,000
Interstate Railroad	.....	250,000
Kansas, Oklahoma & Gulf	.....	265,000
Lehigh & New England	.....	1,500,000
Lehigh Valley	.....	2,000,000
New York, Chicago & St. Louis	.....	5,028,500
New York, New Haven & Hartford	4,850,000	3,500,000
Northern Pacific	.....	1,252,000
Pennsylvania	84,000,000	77,000,000
Pittsburgh & West Virginia	47,000	.....
Southern Pacific	.....	12,000,000
Wabash	1,489,803	1,489,000
Waco, Beaumont, Trinity & Saline	5,000,000	.....

Inquiries or orders for new equipment, the building in company shops or purchasing of which will be financed with the money allotted by the P. W. A., have been placed as follows:

	Locomotives	Freight cars	Passenger cars
B. & O.	..	820 coal	..
C. of Ga.	..	200 coal	..
C. & O.	..	4,500 hopper	15 coaches
		2,500 gond.	11 bag. & mail
		800 box	
Erie	..	125 flat	125 coaches
		100 furn.	8 bag. & mail
		500 auto.	
		2,500 hopper	
		500 box	
L. & N. E.	..	500	
N. Y. C. & St. L.	15 freight	500 box	7 coaches
	5 switchers	500 gond.	1 bag. & mail
	20 tenders	175 stock	
		25 flat	
Nor. Pac.	10 pass.*	..	..
Penn.	100 elect†	7,000†	..

* Order placed with the Baldwin Locomotive Works.

† The freight cars and a number of the locomotives will be assembled in the company's own shops.

Programs for the repair or improvement of equipment are being developed as follows:

Baltimore & Ohio.—Repairs to 5,000 freight cars and 240 locomotives.

Boston & Maine.—Reconditioning locomotives, freight cars and passenger cars.

Illinois Central.—Repairs to 16,015 freight and 228 passenger cars.

Interstate Railroad.—Rebuilding 500 coal cars.

Lehigh Valley.—Heavy repairs to 1,000 coal cars, rebuilding 1,000 box cars, and classified repairs to 60 locomotives.

New York, New Haven & Hartford.—Air conditioning 142 steel passenger cars assigned to through service between New York and Boston and New York and Springfield; repairing and painting 210 multiple-unit coaches; general overhauling and reconditioning of 900 cars which have reached an average age of 15 years, including the renewal of roof and side sheets for 139 of them and general repairs and certain minor improvements to the 142 cars to be air conditioned. Painting and heavy repairs for 95 all-steel cars of the New York, Westchester & Boston.

Southern Pacific.—Reconditioning locomotives and cars.

Wabash.—Repairs and modernization of 1,500 cars.

Settle Shopmen's Wage Dispute in Canada

A compromise has been reached in the wage dispute between the Canadian shop crafts employees, numbering some 35,000, and the Canadian railways. Both parties have agreed to a 15 per cent reduction from basic wages for one year, dating from December 16, thus bringing these employees' conditions in line with clerical and operating department employees who likewise have accepted a 15 per cent reduction for a year.

Employees whose bulletined working time is less than 40 hours per week will have only a 10 per cent reduction. At the end of one year the reduction will drop to 10 per cent for those workers who now take the 15 per cent. After October 16, 1934, either party may serve 30 days' notice of a desire to change the percentage for the year following. Both parties expressed themselves as pleased at having been able to reach common ground.

Hearing on Manufacturers' N. R. A. Codes

A public hearing on the codes submitted to the National Recovery Administration by several branches of the railway equipment and appliance industry was held before Deputy Administrator H. O. King at Washington on December 21 in connection with approximately forty separate codes representing industries affiliated with the Machinery and Allied Products Institute, which had been formed to advise member industries on code matters with a view to the establishment of uniform employment conditions. The proposed codes, which had already been the subject of numerous conferences and revisions for the purpose of bringing them into accord with the general policies established by the N.R.A., include practically uniform conditions as to wages, hours, and other labor provisions, but differ somewhat in the trade practice and administrative sections and leave full autonomy with each trade association concerned in while providing for separate code authorities for each industry. At the outset of the hearing J. W. O'Leary, president of the Machinery and Allied Products Institute, asked that the references to that organization in the various codes be deleted but he submitted in tentative form a proposal for provision for a consolidated code authority in addition to the ones separately provided for.

The proposed codes of special interest to the railroads are those of the Locomotive Institute, the membership of which is composed of builders of locomotives of more than 1,200 hp. per locomotive; the Associated Builders of Small Locomotives, builders of locomotives of 600 hp. or less, and parts thereof; the Railway Appliance Manufacturers' Association, manufacturers of railway hand cars, push cars, velocipede cars, motor cars and special appliances thereof, locomotive water cranes and parts thereof; the Railway and Industrial Spring Association, producers and sellers within the United States of hot-formed helical, elliptical and special springs, and/or pressed steel journal box lids and/or pressed steel spring plates; the Steel Tire Association, and the Diesel Engine Manufacturing Industry.

The codes provide for a maximum work week of 40 hours but with provision for 48 hours in peak periods and under special conditions, with a minimum wage rate of 40 cents an hour except where the rate was lower on July 1, 1929, in which event the minimum may be as low as 35 cents. In general they provide for an initial period of 120 days after which they might be terminated by a vote of two-thirds of the employers assenting to a particular code.

A representative of the Division of Economic Research and Planning of the N.R.A. asked each industry to file statistics regarding their payrolls, products, and wages, showing the number employed at the minimum and the seasonal fluctuations in production and employment.

Results of Mechanical Division 1933 Letter Ballot

At the session of the American Railway Association, Mechanical Division, held in Chicago, June 27, 1933, the recommendations from various committees were ordered submitted to a letter ballot of the members. These recommendations, totaling 51 in number, to amend the standard and recommended practice of the division, have just been formerly approved, effective March 1, 1934.

The detailed results of the letter ballot are covered in Mechanical Division circular No. D.V.-810, which shows favorable action regarding recommendations of the various committees, as follows:

Brakes and Brake Equipment.—(1) On the proposition to permit the use of the wing-type emergency valve and piston, and the short-stem-type emergency valve.

(2) On the proposition to adopt as standard the requirement that A. R. A. standard triple-valve test racks must be equipped with a device for locating the feed groove, as recommended by the committee.

(3) On the proposition to adopt as standard the No. 15 brake beam, including compression member, tension member, head, strut, shoe key and assembly, and the substitution of head, strut and assembly for those now shown in the Manual.

Car Construction.—(4) On the proposition to adopt as recommended practice, designating letters and definition for box cars equipped with permanent automobile stowing equipment.

(5) On the proposition to adopt as recommended practice, designating letters and definition for electric passenger trailers.

Couplers and Draft Gears.—(6) On the proposition to substitute knuckle nose wear and stretch limit gage No. 24992-A for gage No. 24992. (Note: In the stretch limit portion of Gage 24992-A, as shown on page 27 of Circular D.V.-807, the $11^{9}/_{16}$-in. dimension should be corrected to $11^{18}/_{16}$ and the $1^{1}/_{16}$-in. dimension should be corrected to $1^{12}/_{16}$. The gage should also have the letter "A" stenciled on it in addition to the number to designate the latest type gage.)

(7) On the proposition to adopt as standard, the revised coupler contour shown in Fig. 3, pages 29-56, to be designated as A. R. A. Standard No. 10-A contour.

(8) On the proposition to adopt as standard the relocation of the knuckle-pivot-pin hole and the addition to the pulling surface of the pin protectors of standard Type-E couplers.

(9) On the proposition to approve as standard, the change in radii of pulling lugs and pin protectors for standard Type-E couplers.

(10) On the proposition to approve as standard, the changes to A. R. A. standard Type-E coupler gages.

(11) On the proposition to authorize the coupler manufacturers to scrap their patterns, core boxes and gages covering the Type-D coupler bodies.

Loading Rules.—(12) On the proposition to show Interchange Rule 36 in the revised Loading Rules in condensed form.

(13) On the proposition to add paragraph to the General Rules.

(14) On the proposition to add paragraphs to Loading Rule 1, Sec. L, Par. 2.

(15) On the proposition to revise Fig. 23, Rule 132.

(16) On the proposition to revise Fig. 44-E, Rule 201-A.

(17) On the proposition to revise Loading Rule 220.

(18) On the proposition to adopt proposed Fig. 60-A in place of Fig. 58, 59 and 60, Rule 223.

(19) On the proposition to revise Loading Rule 230 and eliminate Sketch A.

(20) On the proposition to revise Loading Rule 240-B.

(21) On the proposition to adopt revised figures for the loading of cast-iron pipe, Rule 252.

(22) On the proposition to revise Loading Rule 261.

(23) On the proposition to reduce the size of stakes.

(24) On the proposition to revise the requirements for cleats underneath car floors.

(25) On the proposition to adopt the methods proposed by the Committee for the loading of steel-wire mesh and bar mats.

(26) On the proposition to revise Loading Rule 302 and Fig. 99, 100 and 101, and adopt new Fig. 101-A-1.

(27) On the proposition to revise Loading Rule 302-A.

(28) On the proposition to adopt Fig. 101-H and 101-I covering the loading of heating and locomotive-type boilers.

(29) On the proposition to revise Rule 306 and Fig. 103-A and 103-C.

(30) On the proposition to adopt new Fig. A, B and C covering the loading of four-wheel auto trailers, composite freight containers and all-metal freight containers.

(31) On the proposition to revise Loading Rule 405 and Fig. 112-C and eliminate Fig. 112-B.

(32) On the proposition to revise Loading Rule 414 and Fig. 111.

Locomotive Construction.—(33) On the proposition to adopt as recommended practice, reducing tees, air pump union studs, reducer couplings and caps, and straight pipe couplings.

(34) On the proposition to revise Page 8, Sec. F, of the Manual, covering shrinkage allowances for locomotive tires.

(35) On the proposition to adopt as recommended practice that convex die blocks be used in clamping bands in hydraulic press, as shown by Fig. 3, or its equivalent.

(36) On the proposition to adopt as recommended practice that nibs be applied to the two outer top and bottom leaves alongside of the band and in the center, as per Fig. 4, or in the center with band depression looking into the nib.

(37) On the proposition to adopt recommended practice for checks, flanges, stud-circle diameters and reinforced plates for injectors.

Lubrication.—(38) On the proposition to add to the recommended practice for new car oil, a specification for all-year-service car oil.

(39) On the proposition to revise the specifications for dust guards.

Specifications for Materials.—(40) On the proposition to replace the present standard specifications for carbon-steel bars for railway springs with recommended-practice specifications.

(41) On the proposition to revise the recommended-practice specifications for carbon-steel castings.

(42) On the proposition to revise the recommended-practice specifications for air, gas and oxygen hose.

(43) On the proposition to revise the recommended-practice specification for chain.

(44) On the proposition to revise the recommended-practice specification for elliptic springs.

(45) On the proposition to withdraw from the Manual all of the specifications for paints and paint materials.

(46) On the proposition to withdraw from the Manual the present recommended-practice specifications for lumber and replace them with the revised specification recommended by the Committee.

Tank Cars.—(47) On the proposition to revise standard drawings of A. R. A. fundamental dome ring and cover.

(48) On the proposition to adopt as recommended-practice, dome covers for ICC-104-A and ICC-105-A tank cars.

Wheels.—(49) On the proposition to revise the recommended-practice specifications for cast-iron wheels.

(50) On the proposition to revise the recommended-practice symbols for marking defective cast-iron, cast-steel, wrought-steel and steel-tired wheels.

General Committee.—(51) On the proposition to adopt alternate location for retaining valve on box and other house cars.

Dean Potter Added to Committee on Railway Research

DEAN A. A. POTTER of Purdue University has been added to the Committee on Railway Research of the Science Advisory Board, according to an announcement by Dr. Karl T. Compton, chairman of the board.

Dean Potter is president of the American Society of Mechanical Engineers and an authority on steam engineering at Purdue University, whose laboratories have long been famous for their co-operation with railroads and railroad equipment companies in engineering research and tests. This committee, chosen from among the leading directors of industrial research in the country, was formed at the request of Joseph B. Eastman, federal co-ordinator of transportation, to co-operate with a corresponding committee of railroad executives.

"This co-operation," said Dr. Karl T. Compton, "should go far toward convincing the public that the railroads are making a determined effort to improve their service to the public and to strengthen their financial position by taking maximum advantage of modern technology. To bring this about, these leaders of industrial research have agreed, without compensation and for the public good, to co-operate with the railroad executives in an effort to map out the best plan that their joint knowledge and experience can devise, and to assist in putting this plan into operation. Contrary to certain reports, there is no suggestion or probability of forcing on the railroads a huge central research laboratory."

According to Dr. Compton, the probable approach of these joint committees will be a survey of the research facilities and procedures now existing in the railroad and equipment companies and a comparison of these with the similar bases of research in outstandingly successful industries. The object will be to determine whether the principles of scientific research are being applied in the railroad industry as thoroughly and effectively as is reasonably practicable, and, if not, how this situation can best be corrected. The survey will not be shaped or guided by preconceived ideas, and will be carried on with full realization that the conclusions reached must fit the peculiar conditions of the industry.

Supply Trade Notes

JOSEPH T. RYERSON & SON, INC., Chicago, has commenced work on an extensive addition to its St. Louis, Mo., steel service plant.

B. T. THOMPSON, general sales agent of the Standard Oil Company of Indiana, with headquarters at Chicago, retired on December 30.

THE INDEPENDENT PNEUMATIC TOOL COMPANY has moved its New York sales office from 1463 Broadway to 330 West Forty-second street, New York City.

JOSEPH T. RYERSON & SON, INC., of Boston, New York and Chicago has purchased the stock and good will of Bacon & Co., iron and steel company of Boston, Mass.

THE PITTSBURGH PLATE GLASS COMPANY, Pittsburgh, Pa., is building an addition to its Duplate plant at Creighton, Pa. The addition will consist of a three-story wing of steel, concrete and brick construction.

D. J. ALMON, Paul Brown building, St. Louis, Mo., has been appointed district sales agent for Morrison Metalweld Process, Inc., Buffalo, N. Y. Mr. Almon will represent this company in the Southwest territory.

E. A. TOLLEY, since February, 1933, assistant manager and prior to that salesman in the San Francisco (Cal.) branch of the Garlock Packing Company, Palmyra, N. Y., has been appointed district manager of that branch, succeeding C. D. Allen, deceased.

JOSEPH MCNALLY, formerly connected with the General American Tank Car Corporation, Chicago, has been appointed sales engineer of Iron & Steel Products, Inc.

B. R. WETHERBY, 404 Donovan building, Detroit, Mich., has been appointed Michigan representative of Huron washout plugs and other railroad and industrial specialties manufactured by the Huron Manufacturing Company, Detroit. Mr. Wetherby will handle also certain roads in the Ohio district.

H. ROSS POULSON has been appointed sales engineer in the Transportation and Government department of the Johns-Manville Sales Corporation, with headquarters at Chicago. Mr. Poulson was formerly associated with Johns-Manville, and during a brief interruption in his employment was associated with the American Hair & Felt Company.

MYRON C. TAYLOR, chairman of the United States Steel Corporation, announces that Edward R. Stettinius, Jr., has been selected by the Finance committee for the position of vice-chairman of the Finance committee of the corporation, effective April 1, 1934, and succeeding to the vacancy arising from the promotion of William J. Filbert to the chairmanship. Mr. Stettinius is at present vice-president of General Motors Corporation.

F. R. FAULK, 50 Penn avenue, Pittsburgh, Pa., has been appointed district sales representative of the Universal Power Corporation, Cleveland, Ohio, and the Welding Equipment & Supply Company, 2720 East Grand boulevard, Detroit, Mich., has been appointed Detroit distributor for the same corporation.

PHILIP C. KEMP, formerly a member of the law firm of Simpson, Thacher & Bartlett, New York, and more recently a deputy administrator of the N.R.A., has been appointed vice-president and general counsel of the American Locomotive Company.

MYRON C. TAYLOR, has retired as chairman of the Finance Committee of the United States Steel Corporation, but will continue his other offices as chairman of the board of directors and chief executive officer. William J. Filbert succeeds Mr. Taylor as chairman of the Finance Committee.

W. A. NUGENT has been appointed sales manager of the Independent Pneumatic Tool Company, Chicago. Mr. Nugent, formerly district manager of the Chicago territory, has been with the company 19 years and during this period has served as St. Louis, Mo., branch manager, as assistant to the president and in other similar capacities. He assumed his new duties on December 1 and was placed in active charge of all pneumatic and electric tool sales.

B. C. HOOPER, formerly sales manager of the Industrial Truck division of the Baker-Raulang Company, Cleveland, Ohio, has been placed in charge of this company's Chicago sales office. For many years Mr. Hooper acted as dealer for the Baker-Raulang Company in St. Paul, Minn.; he was then transferred to the Cleveland factory as special railroad representative, and in 1929 was made sales manager. W. F. Hebard, formerly of the W. F. Hebard Company, who represented the Baker-Raulang Company for many years in Chicago, is associated with Mr. Hooper and will continue to handle their railroad activities.

C. W. BENNETT on January 1 became president of the American Sheet & Tin Plate Company, with headquarters at Pittsburgh, Pa. Mr. Bennett has been connected with the steel industry since 1892. He has been with the American Sheet & Tin Plate Company, or properties absorbed by it, since 1897, serving in various capacities and was acting president of that company since January 1, 1933. Eugene W. Pargny, whom Mr. Bennett succeeds as president of the American Sheet & Tin Plate Company, has served as president of that company since 1909. Mr. Pargny entered the employ of the Apollo Iron & Steel Company in 1890 continuing with that company and its successor, the American Sheet & Tin Plate Company, in various official capacities. In 1904 he served as second vice-president and in 1906, was elected first vice-president, becoming president in January, 1909. Mr. Pargny at his own request has been relieved of his duties and retired under the pension plan of the United States Steel Corporation, of which the American Sheet & Tin Plate Company is a subsidiary.

HARRY W. MCQUAID and HAROLD T. BLAIR have joined the metallurgical staff of the Republic Steel Corporation, Youngstown, Ohio; Howard W. Burkett has been transferred from Youngstown to the post of metallurgical engineer in the Buffalo district, and Elmer Larned has been appointed metallurgical engineer in the Chicago district. Mr. McQuaid will devote his time to research and development work, and Mr. Blair will specialize in tin-plate products.

F. W. WATERMAN, president of the National Tube Company, a subsidiary of the United States Steel Corporation, retired under the pension plan of the corporation on January 1. Except for a brief period when he was connected with the Canadian steel companies, Mr. Waterman has been in the service of various companies now

Benjamin F. Harris

affiliated with the United States Steel Corporation in sundry capacities, serving since January, 1920, as president of the National Tube Company. Benjamin F. Harris, president of the Oil Well Supply Company, one of the subsidiary companies, succeeds Mr. Waterman as president of the National Tube Company. Mr. Harris, who will continue also as president of the Oil Well Supply Company, first became connected with the steel industry when he entered the service of the American Sheet & Tin Plate Company in 1903.

A. L. HUMPHREY has been elected chairman of the board of the Westinghouse Air Brake Company, to succeed the late H. H. Westinghouse. At the time of his election Mr. Humphrey was executive director, and prior to that time had been president for 14 years. His latest achievement is significant for two reasons: It marks the culmination of 30 years' service with the company, and it is the first time during the company's history that anyone outside of the immediate Westinghouse family has been so honored. Mr. Humphrey was born at Buffalo, N. Y., but later moved to a rural community in the middle west. He received his early education at the country schools of Maquoketa, Iowa, and Plattsmouth, Neb., and worked on the farm. Following this, he obtained a position as a drug clerk and thereupon determined to study pharmacy. Circumstances intervened, however, as a local physician, then chief surgeon for the Burlington & Missouri River (now part of the C. B. & Q.), recognizing a mechanical trend in the youth's mind, persuaded Mr. Humphrey in 1877 to accept a position as machinist apprentice with what is now known as the Chicago, Burlington &

A. L. Humphrey

Quincy. His mechanical aptitude and ability to handle men were soon recognized and rapid advancement followed, leading him to places of continually growing importance in the mechanical division of seven different western railroads. While following his profession in Colorado he became interested in politics and was elected to the legislature, serving two terms, including one as speaker of the House. Later he became superintendent of motive power of the Chicago & Alton, which position he relinquished to join the Westinghouse Air Brake Company as western manager at Chicago in 1903. Two years later he went to Pittsburgh as general manager. Since then he has held the following positions: Vice-president and general manager, 1910; director, 1913; president, 1919; executive director, 1932. In addition Mr. Humphrey has many business connections including the following: Chairman of the board, Union Switch & Signal Company; Massey Concrete Products Corporation, Chicago; National Brake & Electric Company, Milwaukee, Wis.; First National Bank of Swissvale; Swissvale Trust Company; Westinghouse International Brake & Signal Company; Chairman of the executive committee and director, Pittsburgh Aviation Industries Corporation. Director, American Brake Company; American Brake Shoe & Foundry Company; Bendix Aviation Corporation, Chicago; Canadian Westinghouse Company, Ltd., Hamilton, Ont.; Federal Reserve Bank of Cleveland, Pittsburgh Branch; First National Bank of Pittsburgh; Pennsylvania Airlines, Inc.; Safety Car Devices Company; Union Trust Company of Pittsburgh; Westinghouse Pacific Coast Brake Company; Bendix-Westinghouse Automotive Air Brake Company; Westinghouse Air Brake Home Building Company. Vice-president and director, East Pittsburgh & Wilmerding Coal Company. Trustee, University of Pittsburgh.

(*Turn to next left-hand page*)

BETTER MATERIALS MAKE POSSIBLE HIGHER BOILER CAPACITY

Locomotives have practically reached the weight limits of roadbed and structures. « « « To increase boiler capacity, obtain greater tractive effort and still keep within weight restrictions, is the aim of designers today. « « « Agathon Alloy Steels are a valuable aid. They provide the essential higher strength, shock-resistance and anti-fatigue qualities in smaller-section, lighter-weight forgings. Savings of several tons of weight per locomotive are possible. « « « Whatever the weight-saving, it can be put into the boiler to increase its capacity and provide greater tractive effort—without exceeding weight limits. « « « Give careful consideration to Agathon Alloy Steels and their weight-saving possibilities on new power. Use them for replacements on existing locomotives, too! Here they assure greater forging dependability and safeguard operation. « « « « « « «

Toncan Iron Boiler Tubes, Pipe, Plates, Culverts, Rivets, Tender Plates and Firebox Sheets • Sheets and Strip for special railroad purposes • Agathon Alloy Steels for Locomotive Parts • Agathon Engine Bolt Steel • Agathon Iron for pins and bushings • Agathon Staybolt Iron • Climax Steel Staybolts • Upson Bolts and Nuts • Track Material, Maney Guard Rail Assemblies • Enduro Stainless Steel for dining car equipment, for refrigeration cars and for firebox sheets • Agathon Nickel Forging Steel.

CENTRAL ALLOY DIVISION, MASSILLON, OHIO

REPUBLIC STEEL
CORPORATION
GENERAL OFFICES YOUNGSTOWN, OHIO

AGATHON STEELS

Obituary

JOSEPH L. TILLMAN, SR., vice-president of the Wine Railway Appliance Company, Toledo, Ohio, died on January 1.

ARTHUR A. BROWN, assistant to vice-president of the Westinghouse Electric & Manufacturing Company, died on December 19 at his home in Mount Vernon, N. Y.

ROBERT VINCENT DEVLIN, engineer of the industrial locomotive division of the General Electric Company, died at his home in Erie, Pa., on December 20.

FRANK L. NORTON, vice-president of the Scullin Steel Company, died suddenly on December 21 in his office in the Grand Central Terminal, New York.

C. D. ALLEN, district manager of the San Francisco (Cal.) branch of the Garlock Packing Company, Palmyra, N. Y., died on December 4 at Burlingame, Cal. Mr. Allen began his services with the Garlock Packing Company in March, 1903, as a clerk in the main office at Palmyra. He also served in the Cleveland branch, later becoming salesman at Cleveland, Ohio. He subsequently was consecutively manager for the same company of the Cleveland, Boston, Mass., New York and San Francisco branches. He had been on leave since August, 1932.

WILLIAM SHERWOOD BOSTWICK, of Waynesboro, Pa., formerly vice-president and general manager of Magnus Company, Inc., New York, died on November 28, at his home following a short illness. Mr. Bostwick was born at Duplain, Mich., on February 5, 1858. He went to Waynesboro in September, 1917, and with his son-in-law, Chester A. Lyon, took over the Waynesboro Foundry & Machine Company, under the name of Bostwick-Lyon Bronze Company. In 1923, the Bostwick-Lyon Bronze Company merged with the Chicago Bearing Metal Company, of which concern he was director and vice-president and three years later these companies merged with the Magnus Company, Inc. Mr. Bostwick had served as vice-president and general manager of the Magnus Company, Inc., and three years ago retired from active business.

THOMAS FINIGAN, first vice-president of the American Brake Shoe & Foundry Company, with headquarters at Chicago, died on December 25 of heart disease at his home in that city, at the age of 51 years. Mr. Finigan was born at Paterson, N. J., on September 26, 1882. In 1897 he entered the mechanical department of the Consolidated Traction Company at Newark, N. J. (now the Public Service Coordinated Transport) and later became assistant master mechanic, which position he held until 1902 when he entered the mechanical department of the United Railways at San Francisco, Cal. In 1906 he was in charge of rehabilitation work following the earthquake. Subsequently he served as purchasing agent and assistant general manager, in 1915 becoming Pacific Coast manager of the American Brake Shoe & Foundry Company, with headquarters at San Francisco. In 1918 he was elected vice-president, with headquarters at Chicago, which position he held until 1929 when he became first vice-president. Since 1920 Mr. Finigan had been president of the American Brake Shoe & Foundry Company of California, and since 1927 president of the American Brakeblok Corporation, automotive subsidiary of the American Brake Shoe & Foundry Company. He was a director of the American Brake Shoe & Foundry Company, the American Brakeblok Corporation, the American Brake Shoe & Foundry Company of California, American Forge Company, American Malleables Company, American Manganese Steel Company, National Bearing Metals Corporation, Racor Pacific Frog & Switch Company, Ramapo Ajax Corporation, and the Southern Wheel Company.

ARCHIBALD ALSTON STEVENSON, one of the pioneering leaders in the iron and steel industry, and formerly vice-president of the Standard Steel Works Company, died at his home in Ardmore, Pa., on December 15, after an illness of several months. The immediate cause of his death was pneumonia. Mr. Stevenson's entire life was spent in the iron and steel industry, and he was directly connected with many of its technical and engineering advances. He was born on April 10, 1862, at Allegheny, Pa., and was educated in the schools of Pittsburgh, Rock Island, Ill., and the University of Illinois. From 1881 to 1886 he was a draftsman at the Southwark Foundry & Machine Company, Philadelphia, Pa., then became affiliated with the Cambria Iron & Steel Company at Johnstown, Pa. There he worked with John Coffin on experiments with the Coffin toughened axles and forgings, and early in 1887 designed the furnace and equipment for their commercial treatment. This was one of the first uses of heat treatment on a large commercial scale in the United States. On August 1, 1888, he entered the employ of the Standard Steel Works Co., Burnham, Pa., and was with this company until his retirement in July, 1929. He served successively as traveling engineer, manager of wheel department, engineer, assistant superintendent, superintendent, and vice-president. From 1920 to 1929 he was in charge of manufacturing operations. Mr. Stevenson took an active part in the work of several engineering societies and clubs. He was a past-president (1916) and an honorary member (1927) of the American Society for Testing Materials, and was a member of its Executive committee from 1911 to 1920. He was the first chairman of its committee on Steel Wheels and Tires,, serving in that capacity for 25 years. He was one of the A. S. T. M. representatives who, in 1916, with the representatives of the four Founder Societies (A.S.C.E., A.S.M.E., A.I.M.E., A.I.E.E.) instituted work which resulted in 1918 in the organization of the American Engineering Standards Committee, now the American Standards Association. Mr. Stevenson was very active in the work of this body and served as chairman in 1920 and 1921. He was a member of the American Society of Mechanical Engineers, American Institute of Mining & Metallurgical Engineers, American Iron & Steel Institute, American Society for Steel Treating and a past-president of the Association of American Steel Manufacturers.

HERBERT THACKER HERR, vice-president of the Westinghouse Electric & Manufacturing Company, died after a short illness at his home in Philadelphia, Pa., on December 19. Mr. Herr was born on March 19, 1876, at Denver, Colo., and was graduated from the Sheffield Scientific School in 1899, winning the prize in mathematics and receiving the degree of bachelor of philosophy. Previous to entering college he had acquired some commercial and mechanical experience as a machinist apprentice on the Chicago & North Western. After his graduation he served two years as machinist and draftsman on the

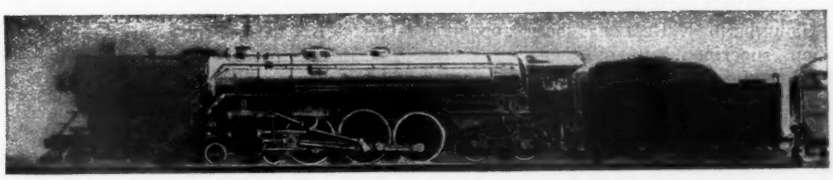
Herbert Thacker Herr

Denver & Rio Grande (now part of the Denver & Rio Grande Western) and acted also as chairman of a committee to revise the operating rules of that road. In 1902 he served as master mechanic on the Chicago Great Western, then on the Atchison, Topeka & Santa Fe, and later as general master mechanic of the Eastern division of the Norfolk & Western. He returned later to the Denver & Rio Grande as assistant to the vice-president, becoming general superintendent in 1906. Soon afterwards he retired from railroad work and in 1908 went to Pittsburgh, Pa., as general manager of the Westinghouse Machine Company. Shortly thereafter, he was promoted to second vice-president and general manager, and in 1913, became first vice-president and general manager. When this company was merged in 1917 with the Westinghouse Electric & Manufacturing Company he became vice-president of the latter and continued in that capacity until the time of his death, with headquarters at the South Philadelphia (Pa.) works. Mr. Herr invented various improvements in the design and construction of turbines, oil and gas engines and various ingenious air brake devices. He was a member of a number of technical societies, including the American Institute of Mining Engineers, the American Society of Mechanical Engineers, the American Society of Naval Engineers, the Society of Naval Architects and Marine Engineers, the Society of Automatic Engineers, and the American Railway Guild.

(*Turn to next left-hand page*)

Lights that burned all day just to be ready for use at night would be an appalling waste.

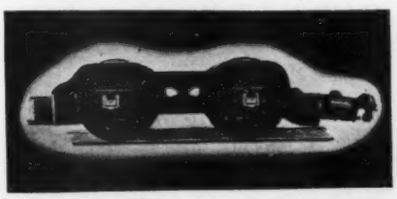
The BOOSTER Supplies Power *Only* When You Need It



It is a similar waste to build a locomotive with large cylinders and perhaps another pair of drivers just to provide power for starting. Then, the big cylinders continue to work all the rest of the trip when the peak power is not needed.

Rather use The Locomotive Booster to supply the power peaks and combine it with a smaller cylindered main engine. Once the need for the peak power has passed, The Locomotive Booster becomes inoperative. Then the smaller locomotive handles the train efficiently for the rest of the trip.

The combination of the Booster and smaller main engine cylinder results in reduced maintenance and increased operating efficiency.



FRANKLIN RAILWAY SUPPLY COMPANY, INC.

NEW YORK CHICAGO MONTREAL

Personal Mention

General

R. C. McINTYRE has been appointed superintendent of motive power of the Union Railroad, with headquarters at East Pittsburgh, Pa.

Master Mechanics and Road Foremen

BENJAMIN E. JONES has been appointed master mechanic motor equipment of the Erie and its subsidiaries, with headquarters at Susquehanna, Pa.

Car Department

D. C. TISCH, coach foreman of the Missouri Pacific at Sedalia, Mo., has been appointed assistant general passenger car foreman, with headquarters at Sedalia.

GEORGE E. ADAMS has been appointed division car foreman of the Erie, with headquarters at Pen Horn, N. J., succeeding Raymond Knorr.

RAYMOND KNORR has been appointed division car foreman of the Erie, with headquarters at Cleveland, Ohio, succeeding Townsend J. Bell.

GEORGE B. CARTWRIGHT, assistant general passenger car foreman of the Missouri Pacific at Sedalia, Mo., has been appointed general passenger car foreman, with headquarters at Sedalia.

Shop and Enginehouse

TOWNSEND J. BELL has been appointed shop superintendent of the Erie, with headquarters at Pen Horn, N. J., suc-Joseph L. Ortner, resigned.

ALBERT HUBENER, general foreman of the Missouri Pacific at North Little Rock, Ark., has been promoted to the position of superintendent of shops at North Little Rock, to succeed G. T. Callender.

G. T. CALLENDER, superintendent of shops of the Missouri Pacific, at North Little Rock, Ark., has been transferred to the position of superintendent of shops at Sedalia, Mo., to succeed J. W. Lemon.

J. M. WATERS has been appointed general foreman of the locomotive department of the Illinois Central, with headquarters at East St. Louis, Ill., succeeding J. N. Fox, who has been transferred to Chicago.

Purchasing and Stores

W. H. MORRIS, general storekeeper of the Reading, has had his jurisdiction extended to include the Central of New Jersey. Mr. Morris's headquarters are at Reading, Pa.

J. D. LANDIS, purchasing agent of the Reading, has had his jurisdiction extended to include the Central of New Jersey. The office of manager of purchases and stores of the Central of New Jersey has been abolished. Mr. Landis' headquarters are at Philadelphia, Pa.

Obituary

HARRY E. ROUSE, formerly general storekeeper of the Chicago & Alton (now the Alton) and also of the Chicago Great Western, died on November 27 of blood poisoning at Washington, D. C.

A. P. HOUSHOLDER, mechanical superintendent of the Gulf Coast Lines and the International-Great Northern, whose death was noted in the December *Railway Mechanical Engineer*, entered railway service in 1894 as a machinist apprentice on the Southern at Knoxville, Tenn., becoming a machinist four years later. In 1899 he went with the Illinois Central as a machinist at Paducah, Ky., and in 1904 accepted a similar position with the Missouri Pacific at St. Louis, Mo. After two years Mr. Housholder was promoted to the position of enginehouse foreman at Jefferson City, Mo., later being transferred to St. Louis. In 1909 he returned to the Illinois Central as general foreman at East St. Louis, Ill., again going with the Missouri Pacific in 1912 as division foreman at Dupo, Ill. In 1919 Mr. Housholder was appointed master mechanic at Nevada, Mo. He served in this position at various points until September 1, 1926, when he was appointed mechanical superintendent of the Gulf Coast Lines and the International-Great Northern (subsidiaries of the Missouri Pacific).

Trade Publications

Copies of trade publications described in the column can be obtained by writing to the manufacturers. State the name and number of the bulletin or catalog desired, when mentioned in the description.

GRINDERS.—"Railroad Set-Ups on the F. G. Micro Grinder" is the title of Bulletin No. 104 issued by the Micro Corporation, Bettendorf, Iowa.

ALUMINUM.—Revised editions of "The Welding of Aluminum" and "The Riveting of Aluminum" have been issued by the Aluminum Company of America, Pittsburgh, Pa.

DIES.—J & L tangent dies and ground thread chasers are illustrated and described in an eight-page catalog issued by the Jones & Lamson Machine Company, Springfield, Vt.

DIE HEADS.—Bulletin No. F-80, issued by the Landis Machine Company, Inc., Waynesboro, Pa., describes a new line of Lanco, Landmatic and Landex hardened and ground die heads.

GENUINE WROUGHT-IRON BILLETS.—A four-page folder, printed in red and black, issued by the A. M. Byers Company, Pittsburgh, Pa., describes Byers Genuine wrought-iron billets and illustrates the process of manufacturing.

TONCAN IRON PIPE.—Facts, figures and technical data on the manufacture, applications and performance of Toncan iron pipe are contained in the 24-page booklet issued by the Republic Steel Corporation, Youngstown, Ohio. Another booklet, "Toncan Iron for Permanence," gives information on corrosion-resisting Toncan iron pipe.

ENDURO.—The physical properties, fabrication, annealing, etc., of Enduro 4-6 per cent chromium steels are described in Form ADV. 220-B issued by the Republic Steel Corporation, Massillon, Ohio. These steels, which are available in all the usual forms, are resistant to corrosion, acid attack and scaling at elevated temperatures.

VALVES, FITTINGS AND PLUMBING FIXTURES.—Circular No. 300, issued by the Crane Company, 836 S. Michigan avenue, Chicago, illustrates Crane valves and fittings for use on locomotives and cars, and plumbing fixtures designed especially for railroad coaches. A selection of valves and specialties for railroad power plants, shops, enginehouses, yards, etc., are also shown.

BRONZE CASTINGS.—The Bronze Foundry Division of the Superheater Company at East Chicago, Ind., which is now producing a full line of bronze castings, rough or finished, is described in the 16-page bulletin, B-1, issued by the Superheater Company, 60 East Forty-Second street, New York. The castings are produced in standard bronzes, aluminum bronzes, and super-tensile manganese bronze under the trade name "Elesco".

RESULTS WITH No-Ox-Id.—A comprehensive booklet entitled "Proof of Results with No-Ox-Id in the Railroad Field" has just been issued by the Dearborn Chemical Company, 310 South Michigan avenue, Chicago. This illustrated booklet, containing 28 pages, shows the wide range of railway uses for this chemically-compounded rust preventive. Numerous applications to such parts as locomotive springs, tender coal space, stored car journals, water tanks, bridges, rail bonds, machine finished locomotive and car parts, stored piping, etc., are illustrated and described. The various adaptations of No-Ox-Id protection in the form of (1) a compound, made in various consistencies for all industrial conditions; (2) an impregnated wrapper covering for use under special conditions; (3) fillers and paint primers; and (4) quick-drying protective coatings for specialized interior and exterior use, are described in the booklet, which also contains a partial list of the railroads that have used No-Ox-Id protection in one form or another.